COMMONWEALTH MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XXIX MARCH 1950

LILLY (V. G.) & BARNETT (H. L.). **The inheritance of partial thiamine deficiency in Lenzites trabea.**—*J. agric. Res.*, 77, 11–12, pp. 287–300, 2 graphs, 1948.

In work at the West Virginia Experiment Station single-spore isolates from a single sporophore of *Lenzites trabea* [*R.A.M.*, 28, p. 498] varied considerably in growth rate on thiamine-free media. The differences are considered to be due to differences in ability to synthesize thiamine and were shown to be of genetic origin, but the manner of inheritance is complex.

CORRELL (D. S.). **Collecting wild Potatoes in Mexico.**—*Circ. U.S. Dep. Agric.* 797, 40 pp., 30 figs., 2 maps, 1948. [Received December, 1949.]

This report of a potato-collecting expedition in 1947–8 to the highlands of south-central Mexico is a more complete one than that previously published (*Field and Lab.*, 16, pp. 94–112, 1948). It deals almost entirely with the writer's field work in Mexico and includes the occurrence and distribution of the tuberous *Solanum* spp. found there [cf. *R.A.M.*, 27, p. 380]. Upon arrival at the inspection house of the Department of Agriculture, Washington, it was found that some tubers were infected by *Rhizoctonia* [*Corticium*] *solani*, powdery scab (*Spongospora subterranea*), common scab (*Actinomyces scabies*) [ibid., 25, p. 72], dry rot [*Fusarium* spp.], hard rot, [unspecified] storage rot, and silver scurf (*Spondylocladium atrovirens*).

BLODGETT (E. C.) & RICH (A.). **Potato tuber diseases, defects, and insect injuries in the Pacific Northwest.**—*Pop. Bull. Wash. agric. Exp. Sta.* 195, 116 pp., 2 col. pl., 68 figs., 1949.

Notes are given on the causes, local geographical distribution, importance, symptoms, and control of 68 potato tuber diseases, disorders, defects, and insect injuries found in the Pacific Northwest, together with general recommendations for seed treatment, spraying, dusting, and storage. Water rot (or pink rot) caused by *Phytophthora erythroseptica* [*R.A.M.*, 24, p. 285] is probably important over a wide area, especially in irrigated areas. Black rot, the most common and severe type of storage rot, is attributed to *Fusarium sambucinum* f. 6 [ibid., 25, p. 331; 27, p. 175], *F. caeruleum*, *F. flocciferum* [cf. ibid., 16, p. 434; 19, p. 5], and other *F.* spp., while powdery dry rot, more serious in western States with warm, dry summers, is due to *F. trichothecioides* and possibly other *F.* spp. *F. eumartii* causes side rot. Stem-end hard rot (*Phomopsis tuberivora*) is reported only from the coastal area of British Columbia and Washington. The slightly sunken, circular, brown lesions with grey margins, which extend into the tuber as a conical, dark, centre zone, may remain small or spread over the whole tuber.

Among the less common defects may be mentioned 'feather', in which the skin tissue is scuffed, scaly, and broken. This condition occurs especially in areas producing early potatoes, and is important as it markedly affects the keeping quality of the tubers. Feathered tubers shrivel badly, often develop scald, and offer

entrance to rotting organisms. The condition is due to mechanical injury to the outer skin of immature tubers. Control consists in careful harvesting, only mature tubers being dug for storage. Smooth skin (in Russet Burbank) is also of considerable importance. It is caused by excess nitrogen or potassium, deficiency of phosphorus, a high alkali or strong acid content of the soil, or may be a mutant. Control consists in providing proper nutrition, selecting good 'seed' stocks and eliminating smooth-skinned potatoes from them, and the avoidance of unsuitable soils.

'Measles', of unknown etiology, is characterized by a rough, scaly skin and a dull, lifeless appearance, with sometimes brown or pink areas round the lenticels, darkening to black on storage. It appeared in a serious form in several locations in southern Idaho, and also occurs in the Yakima Valley, Washington. Heat necrosis, caused by high temperatures, especially when the tops die early on light sandy soil, has occasionally accounted for nearly complete losses of crops. Slate-grey to brown patches appear near the vascular strands but are visible only on cutting the tuber. On light soils where high temperatures are liable to occur tubers should be harvested early and adequate moisture provided until digging time. Russet Burbank is resistant.

HUTTON (E. M.). **The separation of strains from a virus X complex by passage through Potato seedlings.**—*Aust. J. sci. Res.*, Ser. B., 1, 4, pp. 439–451, 4 pl., 1948.

In studies made at Canberra, from 1945 to 1947, a high proportion of the potato seedling progenies from crosses between parents tolerant of virus X [*R.A.M.*, 29, p. 47] (Katahdin being common to each cross) gave light to medium necrotic reactions on leaves inoculated with a virus X complex. It was found, however, that localization of the virus was incomplete and that a small percentage of the necrotic reactors were acting as strain separators so that masked, mild, severe, and necrotic strains of virus X were obtained, when inoculations were made from the seedling into *Datura stramonium*. It appears that potato seedlings can cause this separation through an intracellular reaction, which is not visible externally. In some cases all but the masked strains were localized, while in two seedlings a severe systemic necrosis resulted in the development of necrotic strains, probably through the tissues encouraging the development of the necrotic strain in high concentration to the exclusion of the others. The other necrotic strain came from a localized reactor, so the mechanism involved was not clearly defined. Seedlings which initially gave a necrotic reaction were, after further testing, placed in one of three classes: those remaining free from systemic symptoms, those developing a definite mottle, and those developing both mottle and systemic necrosis. Strain separation was found to be influenced by environmental conditions; localization may be complete in midsummer whereas in midwinter most seedlings are ineffective as strain separators.

A small-scale experiment showed the potato seedling technique to be practicable for the separation of strains of virus X from a complex. The results indicated that X-sensitive reactors were necessary for strain separation, although seedlings 50–12 and 50–58, which previously did not act necrotically, developed masked strains. These results also explain the appearance of new and virulent strains of the virus in new potato varieties.

Two types of masked X were distinguished, one which maintained protection against a severe strain at all growth stages of the plant, and another which diminished in concentration in an ageing host plant, thus exposing loci for the multiplication of severe strains. Serological tests indicated that the differences between masked and severe strains of X were due to differences in concentration, the former being present in low concentrations and the latter in high.

Cook (H. T.). **Forecasting late blight epiphytotics of Potatoes and Tomatoes.**—*J. agric. Res.*, 78, 12, pp. 545–563, 11 graphs, 1949.

The forecasting method for epiphytotics of potato and tomato blight [*Phytophthora infestans*] developed for Virginia [*R.A.M.*, 26, p. 360; 27, p. 292; 28, p. 484] was found to be adaptable to the Charleston area, South Carolina. Predictions were based on charts prepared from an analysis of temperature and rainfall over 17 years in relation to the incidence of blight. The critical period begins about 9th April. Such forecasts would have been correct on 84 per cent. of the occasions in the 31-year period 1917–47 at Norfolk, Virginia, and on 81 per cent. during the same period at Charleston. When incorrect, spraying would have been recommended when epiphytotics did not actually develop. The charts for Onley, 60 miles north of Norfolk, and Roanoke, 300 miles to the west, show remarkably similar temperature and rainfall lines and indicate that the forecasts may be applied to a fairly large area. Comparisons of the 1946 and 1947 charts for Norfolk, Onley, and Roanoke and for Salisbury, Maryland, and Dover, Delaware, show a close correlation of the time of appearance and severity of the disease with the temperature and rainfall of the two seasons.

Chouard (P.). **Quatorze années de recherches expérimentales sur la végétation de la Pomme de terre en montagne (Pyrénées Centrales). Conséquences à en tirer.** [Fourteen years of experimental researches on the growth of the Potato in mountainous regions (Central Pyrenees). Conclusions to be drawn.]—*C.R. Acad. Agric. Fr.*, 35, 4, pp. 122–128, 1949.

Since 1935 the author has studied potatoes grown in the Central Pyrenees at altitudes ranging from 2,200 to 800 m., using nearly 80 varieties, all of which grew well [*R.A.M.*, 17, p. 833]. Blight [*Phytophthora infestans*] spreads according to the climatic conditions, as in the plains. Climatic changes, however, are more abrupt in mountainous regions than in the plains and rain is often quickly followed by sunny periods, so that even serious infection is arrested. Although no copper treatments were applied, tuber storage was in no instance endangered by blight. The brief duration of the rains at the end of summer in the mountains is an important factor in reducing late infections.

It was also found that at altitudes over 1,200 m. an interval of 300 m. of fields or heath between healthy potatoes and those affected with virus diseases (mosaic [virus X], crinkle [viruses X+A], leaf roll, and mottle [X]) reduces the risk of contamination to practically nil. A screen of scrub or forest or higher land (1,600 to 1,900 m.) renders the isolation complete. Contamination, however, may occur through insects brought in. Symptoms of 'false leaf roll' ('soft leaf roll') often develop during drought, and should not be confused with those of true leaf roll. No wild plants have been found in which potato virus diseases perennate and contamination is thought to be due to the presence of diseased haulms left from the previous digging and to contamination in storage.

Up to 1942 the author observed in isolated fields near two sequestered villages potatoes of the Chardonne and Beauvais varieties which had been grown continuously for 30 to 50 years or more without renewal of the 'seed', and were yet perfectly healthy. Geographical isolation and the storage of healthy tubers only had sufficed to protect these clones from contamination. From 1935 to 1942 the number of such fields gradually declined because of the storage of healthy and diseased together, and the slow spread of contamination from field to field during summer. To-day no such plantings remain. In the author's own isolated plots, by selecting places where the rainfall was evenly distributed, he succeeded in growing seed potatoes without any special precautions and the tubers so obtained remained free from virus diseases as long as they were grown and stored in isolation.

There are four main factors differentiating potatoes grown in mountainous areas

from those of lowland provenance and affecting their growth the following season when they are used as seed. These are (1) the more intense light in the mountains, (2) nocturnal cold, (3) their relatively immature state at digging, and (4) low temperatures during storage. The loss of yield that can result from one year's contamination in the lowlands is shown by the fact that 100 hills of healthy Josephine potatoes taken directly from the author's 1944 mountain crop and grown at Colombes yielded in 1945 53 kg. as against only 17 kg. for 100 hills of the same variety from seed once grown at Colombes without any precautions. The results of experiments still in progress already show that even when both lots are perfectly healthy, seed potatoes grown in the mountains give better crops than lowland-grown tubers of the same variety. This difference is most marked in early and second-early varieties. Harvesting in an immature condition appears to be less important agronomically than was thought.

Hooker (W. J.) & Peterson (C. E.). **A strain of Streptomyces scabies parasitizing Cayuga Potatoes in Iowa.**—*Plant Dis. Reptr*, 33, 7, p. 282, 1949. [Mimeographed.]

In the autumn of 1948 at Clear Lake, Iowa, deep scab (*Streptomyces* [*Actinomyces*] *scabies*) [*R.A.M.*, 28, pp. 353, 539] developed on Cayuga potato tubers, a variety previously highly resistant to the disease [ibid., 27, p. 34]. In a greenhouse inoculation trial disinfected Cayuga seed pieces were planted in soil infested with eight isolates from three different Cayuga tubers. Two of the isolates caused relatively severe scab while the others were apparently non-pathogenic. These two isolates generally caused deeper scab on Cayuga than did the culture representative of the usual Iowa isolates. Further studies are in progress.

Terman (G. L.), Steinmetz (F. H.), & Hawkins (A.). **Effects of certain soil conditions and treatments upon Potato yields and the development and control of Potato scab.**—*Bull. Me agric. Exp. Sta.* 463, 31 pp., 7 figs., 1948. [Received October, 1949.]

The results of rotation plot experiments conducted from 1935 to 1947 at Presque Isle, Maine, indicated that the incidence of potato scab (*Actinomyces scabies*) [*R.A.M.*, 26, p. 77; 28, p. 117] increased with increasing applications of ground limestone, and with the resulting increase in pH and calcium content of the soil [ibid., 21, p. 469]. Scab developed more rapidly and severely on the less acid, poorly drained Washburn loam than on the more acid and well-drained Caribou loam. In 1946 and 1947 the disease was considerably reduced and sometimes eliminated by one or two applications of sulphur or ammonium sulphate [ibid., 24, p. 245; 28, p. 117], treatment with the latter at 1,200 lb. per acre being the most effective. The amount of the reduction depended on the prevalence of scab, the pH, and other soil characteristics. Yields were significantly higher in the pH range of 4·55 to 6 than at very high or much lower pH levels.

It is recommended that lime applications to finer textured potato soils should not exceed 2,000 lb. ground limestone per acre and to sandy soils 1,000 lb. Finely ground material, evenly spread, should be used containing not less than 10 per cent. magnesium oxide. Soils of pH 5·4 or more or, if the calcium content is high, above 4·8, need no lime. The amounts of sulphur or ammonium sulphate recommended vary from 400 lb. in areas of mild scab to 900 lb. in heavily scabbed soils. Of the scab-resistant varieties Ontario is recommended for Maine.

Lane (G. H.). **Disinfection of a new stationary-type Seed-Potato cutter to control the spread of ring rot.**—*Amer. Potato J.*, 26, 10, pp. 379–384, 2 figs., 1949.

An improved stationary potato cutting knife, which overcomes the tendency of the older model [*R.A.M.*, 26, p. 211; 28, p. 416] to vibrate during rapid cutting,

consists of a sharp, double-edged hack-saw mounted vertically in a rigid frame. The disinfecting solution for ring rot [*Corynebacterium sepedonicum*] control is supplied as before. The satisfactory control of the spread of the disease afforded by the cutter was demonstrated in 1947 and 1948 field tests. Mercuric chloride solution (0·2 per cent.) and calcium hypochlorite solution (5,000 p.p.m. chloride), used at the rate of 2 qts. per hour were equally effective. There appeared to be no differences in the efficacy of disinfection due to one- or two-way cutting, or to the presence or absence of a wetting agent in the solution.

SHERF (A. F.). **Root inoculation, a method insuring uniform rapid symptom development of bacterial ring rot of Potato.**—*Phytopathology*, 39, 6, pp. 507–508, 1949.

The methods commonly employed for the inoculation of potatoes with *Corynebacterium sepedonicum* do not invariably result in infection and resultant symptoms. Experiments by Larson with tomato [*R.A.M.*, 24, p. 164] and Tyner with potato [ibid., 26, p. 353] indicated the likelihood of invasion through the damaged roots, and studies were accordingly carried out at Lincoln, Nebraska, to determine the degree of uniformity of infection and the rate of symptom development in root-inoculated plants.

Ten seed pieces of Bliss Triumph potatoes were sprouted in moist peat, the roots washed in running water, and most of them were cut with scissors $\frac{1}{4}$ in. from their tips. Cut roots of ten plants were dipped for 10 seconds in a water suspension of bacteria expressed from a tuber, while two plants were left untreated as controls. Immediately after inoculation all seed pieces were planted and ring rot symptoms developed rapidly and uniformly within 32 to 38 days. At harvest, 62 days after planting, all the leaves of inoculated plants had developed typical ring rot symptoms, including severe wilt.

In another experiment all plants, of which at least a quarter of the total number of roots were cut and inoculated, contracted 100 per cent. infection, followed by uniform ring rot, in 26 days. In three of four with only two roots so treated, the symptoms did not develop until the 29th day, while in one they were absent though *C. sepedonicum* was detected in the stem. No external signs of infection appeared on the plants of which the roots were not cut before dipping in the bacterial suspension, though two of the four harboured moderate numbers of the causal organism in the aerial stems, ingress having presumably been gained through minor injuries in the roots. Plants in the control series remained healthy. Field studies in 1947 confirmed the greenhouse data.

PUMPHREY (F. V.) & HARRIS (L.). **Cracking of Triumph Potatoes.**—*Amer. Potato J.*, 26, 10, pp. 355–361, 1949.

The results of experiments conducted at the Scotts Bluff Field Station, Nebraska, in the autumn of 1948 demonstrated that severing potato roots with a root-cutter one or two days before digging reduced the cracking of Triumph tubers [*R.A.M.*, 21, p. 40] during harvest.

FRANK (MELANIA). **A Rizs brusone betegsége.** [Rice 'brusone' disease.]—*Agrártudomány* (*Agricultural Science*), 1, 6–7, pp. 298–303, 1 diag., 1949. [Russian and French summaries.]

After pointing out that 'brusone' disease of rice [*R.A.M.*, 17, p. 623; 25, p. 472; 28, p. 486] has been attributed by Italian workers to a number of different causes, the author states that her researches in Hungary in 1947 and 1948 have demonstrated that the disorder is not due to but only aggravated by unfavourable atmospheric conditions. Parasitic organisms play only a secondary part. Soils in which affected plants were growing contained a high level of nitrogen and suffered from a greater lack of oxygen.

Brusone is a biological condition probably due to a complex of circumstances. In Hungary the disease has so far been found only in fields where the rice grows very thickly, especially where the ground has cracked recently. Excess nitrogen induces changes in the plant tissues which reduce its capacity to resist, or it may damage the rice by favouring thick growth, and so inhibiting aeration.

Preventive control consists in deep cultivation of the ground, applications of phosphorus, lime, and potash to soils rich in nitrogen, wide spacing of the plants, clean irrigation water, draining off the water in summer to aerate the soil, and adjustment of soil acidity by liming.

CHEN (S. T.). **Sporulation of Gibberella zeae on Rice straw.**—*Phytopathology*, 39, 9, pp. 761–762, 1949.

Head scab of wheat (*Gibberella zeae*) is prevalent and may be destructive in the humid regions of China, where it severely attacks the widely grown, prolific, and otherwise desirable variety No. 2905. The Chinese isolates of the pathogen appear to differ from the European and American, since the media recommended for its sporulation by Wollenweber (*Phytopathology*, 3, pp. 24–50, 1913) and Dickson (*J. agric. Res.*, 19, pp. 235–237, 1920) proved useless for this purpose in experiments in China. An abundance of macroconidia being necessary for testing varietal resistance to the disease (the development of which is the only practicable measure of control), conditions conducive to their production by an isolate collected in Szechwan Province in April, 1939, were determined. Of eight natural substrata tested at 24° C., only sweet potato cylinders gave rise to macroconidia on 26th December, 1940, 45 days after inoculation. In subsequent tests macroconidia developed in four days at 24° to 26° on rice straw, and over a range from 16° to 28° sporulation was rapid and profuse; at 12° it was delayed and scanty, and at 32° no growth was made. To counteract a tendency to desiccation due to excessive evaporation, 1 gm. rice straw moistened with 1 c.c. tap water, both previously sterilized, was placed on top of solidified 25 c.c. agar in sterilized flasks before adding two drops of a suspension containing 10 to 15 macroconidia. Sporulation was most abundant between the 6th and 15th days. Growth of the fungus for 9 to 18 days on rice straw at 28° with adequate moisture is recommended.

MARTIN (W. J.). **Moldy rot of tapping panels of Hevea Rubber trees.**—*Circ. U.S. Dep. Agric.* 798, 23 pp., 7 figs., 1949.

Studies were made on mouldy rot (*Ceratostomella fimbriata*) [*R.A.M.*, 27, p. 336; 28, p. 356] of the tapping panels of *Hevea* rubber trees in old plantations in southern Mexico from 1943 to 1947. There was considerable cultural variation among isolations from rubber trees but no difference in pathogenicity. The mouldy rot fungus soon rots the soft bark and cambial regions under conditions of high humidity. It penetrates the bark above and below injured areas under some conditions and may be associated with a bark canker prevalent on the old trees. Mouldy rot reduces the length of time trees can be tapped and in severe cases tapping is over original bark only. Fungicides gave some reduction of the disease but the author thinks that at present the only control is to attempt to exclude the fungus from new plantings and eradicate it when first observed.

VENKATARAMANI (K. S.). **A note on a leaf disease of Rubber in South India.**—*Plant. Chron.*, 44, 21, p. 581, 1949.

A disease causing leaf-spotting and defoliation of *Hevea* rubber trees is reported to have been observed first on young plants in certain low-lying areas in South India during 1946. Since June, 1948, however, the disease has spread to other parts of these estates affecting plants of all ages but chiefly those in the nursery. The leaf-spotting was present in both budded and seedling plants. During 1948 nursery

plants were defoliated three to five times in the course of six months. A prolonged and unusual drought from November, 1947, to April, 1948, coincided with a period when the disease was predominant.

A fungus, identified as *Helminthosporium heveae* [*R.A.M.*, 28, p. 356], was isolated consistently from the diseased areas. This appears to be the first report of the spread of this fungus on an epidemic scale in South India. Observations showed that none of the clonal varieties escaped infection, and that where a large-scale budding programme was in progress unions were very poor in severely infected seedlings.

According to Sharples [ibid., 16, p. 60], periodical dusting with sulphur [ibid., 19, p. 115] can be expected to give satisfactory control. Spraying the nursery with Bordeaux mixture (5–5–50) or perenox (4 oz. in 10 gals. water) [ibid., 19, p. 674] has also been suggested.

Skillman (E.). **Soil sterilization—1. Soil sterilization—2.**—*Brit. Fm Mechaniz.*, 1, 7, pp. 252–253, 2 figs.; 8, pp. 288–289, 3 figs., 1949. [French and Spanish summaries.]

The first paper describes modern methods of soil sterilization in Great Britain, of which heat methods are regarded as the most effective, namely, by steam, baking, or electricity. Three methods for injecting steam into the soil are described: the Hoddesdon pipe, a single or double, perforated, steel tube 5 to 7 ft. by $1\frac{1}{4}$ in., the forked grid, and the harrow or spiked grid.

The second paper deals with steam production and pressures, and electric soil sterilizers which operate on the electrode principle. Formaldehyde [*R.A.M.*, 27, pp. 136, 215] (38 per cent. 1 in 50 gals.) is most widely used for chemical sterilization and is either watered over the soil surface or injected with a special fork of tubular steel with perforated tines. A minimum pressure of 120 lb. per sq. in. is required and a small power pump must be used.

Remy (Ellen). **Über niedere Bodenphycomyceten.** [On lower soil Phycomycetes.] —*Arch. Mikrobiol.*, 14, 2, pp. 212–239, 6 graphs, 1949.

The author examined 144 soil samples from various parts of Germany for their content of Phycomycetes other than Mucorales. To aqueous suspensions of the soils were added sterilized 'baits', including dead house flies, hemp seed, fragments of grass and straw, and ant larvae, while pine pollen grains (sterilized or living) were found to be particularly effective in the capture of Chytridiaceae, notably *Rhizophidium pollinis*.

Lower Phycomycetes were present in practically all the samples and their distribution in the different habitats was relatively uniform. The most frequent representatives were *Pythium* [*R.A.M.*, 28, p. 546] (mostly *P. debaryanum*, *P. vexans* [ibid., 26, pp. 132, 417], *P. torulosum* [ibid., 18, pp. 358, 472], and *P. megalacanthum* [ibid., 19, p. 240]), *Rhizophlyctis rosea*, *Rhizophidium* (*R. pollinis*, *R. carpophilum*, and an apparently new species), and *Nowakowskiella elegans*. Among the other species found were *Pseudolpidium gracile* [ibid., 22, p. 144] and *P. pythii*, *Olpidium* spp., and *Pythiomorpha* [*Phytophthora*: ibid., 21, p. 165] spp.

Forest soils and uncultivated ground harboured few of the Phycomycetes, which were much more abundant in areas with human and animal contacts. Clay soils were more heavily colonized than sandy ones, and moist places were, in general, particularly rich in the organisms under observation, though some species were remarkably tolerant of desiccation. For instance, six species, including *Pythium debaryanum*, were still viable after eight years in dry soils, two withstood an hour's exposure at 70° C., and three an hour in liquid air at −180° to −190°.

Besides the 16 genera discussed in the present paper, another four have been isolated from German soils by E. Aldekamp (briefly reported by R. Harder in

Nachr. Akad. Wiss. Göttingen, Abt. H, 1, pp. 5–7, 1948). Sörgel isolated species of 29 genera of the lower Phycomycetes from West Indian soils (*Beih. bot. Zbl.*, Abt. B, 61, pp. 1–32, 1941).

Trocmé (S.). **Les carences minérales des végétaux.** [Mineral deficiencies of plants.] —*Bull. tech. Inform. Ingén. Serv. agric., 1949*, 41, pp. 333–342, 1949.

The author discusses, with numerous references to the literature, the question of mineral deficiencies in plants, especially in relation to the conditions obtaining in France. The aspects of the matter dealt with include the general importance, diagnosis, and treatment of such deficiency disorders in France (including the effect of sulphur, magnesium, manganese, boron, and copper on yields). These disorders are not at present of any serious importance in France.

Coïc (Y.) & Coppenet [M.]. **La carence en manganèse dans les terres humifères de Bretagne.** [Manganese deficiency in the humus soils of Brittany.]—*C.R. Acad. Agric. Fr.*, 35, 8, pp. 323–327, 1949.

This information has already been noticed from another source [*R.A.M.*, 29, p. 18].

Sorteberg (A.). **Diseases of plants due to deficiency of trace elements.**—*Medd. norske Myrselsk.*, 46, pp. 79–90, 1948. [Abs. in *Field Crop Abstr.*, 2, 1, p. 36, 1949.]

In Norway deficiency diseases appear to be caused chiefly by lack of boron, the danger of which is increased appreciably by liming. Ødelien and Vidme found that barley suffers most severely of the cereals from boron deficiency. In carrots the youngest leaves frequently become chlorotic and withered: with serious deficiency the plants die in the seedling stage. The same workers also found that when the soil was watered to only 20 per cent. moisture capacity, boron deficiency occurred more quickly and severely than when it was watered to 60 per cent. of its moisture capacity.

Copper-deficient areas occur primarily along the coast in Sørlandet, Vestlandet, and north Norway. Of cereals oats suffer chiefly from lack of this mineral, and also carrots, turnips, and swedes. Manganese deficiency affects oats severely and iron deficiency occurs in oats and barley chiefly. In pot trials conducted by the State Agricultural Chemistry Station at Trondheim grain yield was increased when zinc was supplied to barley, wheat, and rye. Barley was generally unable to produce ripe grain without the addition of this element. In field trials carried out at the Voll Experiment Station the addition of zinc increased the grain yield of barley and wheat.

Keyworth (W. G.) & Hewitt (E. J.). **Verticillium wilt of the Hop (Humulus lupulus). V. The influence of nutrition on the reaction of the Hop plant to infection with Verticillium albo-atrum.**—*J. hort. Sci.*, 24, 3–4, pp. 219–227, 1948. [Received August, 1949.]

A full account is given of two experiments carried out in 1944–5 and 1946–7 at East Malling to study the effect of *Verticillium albo-atrum* [*R.A.M.*, 28, pp. 358, 420] on Fuggle hop cuttings growing in sand cultures supplied with various nutrient solutions. The plants were grown in the cultures for one season before the latter were inoculated with chopped hop stem infected with a progressive strain of the fungus. Of the treatments tested, reduced nitrogen (one-third normal) caused the most marked and consistent reduction in disease incidence and severity [ibid., 23, p. 154]. Many of the nitrogen-deficient plants from which the fungus was isolated presented no external symptoms of infection, and *V. albo-atrum* had failed to grow farther than the crowns of the plants or the lower parts of the stems. It may,

therefore, be concluded that the conditions present in these plants had inhibited both the growth of the pathogen and its ability to cause wilting. In the earlier experiment (only), reductions in potassium, phosphorus, and, to a less extent, magnesium also reduced disease incidence and severity as measured by visible symptoms, while plants grown in compost also showed no disease symptoms. Two plants with least wilt had a high manganese status. As all these treatments resulted in some degree of plant starvation, the resultant reduction in disease may, possibly, be related more to general starvation than to lack of any one element, but the evidence on this point was inconclusive as the effects observed were not repeated in the second experiment.

Ciferri (R.). **Rassegna di parassiti e malattie del Cappero (Capparis spinosa L.) in Italia.** [Review of the parasites and diseases of Caper (*Capparis spinosa* L.) in Italy.]—*Notiz. Malatt. Piante*, [*1949*], 3, pp. 33–35, 1949. [Mimeographed.]

A list is given of the fungi hitherto recorded on caper (*Capparis spinosa* and *C. inermis*) in Italy, with brief notes on white rust (*Albugo* [*Cystopus*] *capparidis*), considered by some workers a synonym of *A. candida* [*C. candidus*: *R.A.M.*, 27, p. 542]. This is the commonest fungal disease of caper, and is most prevalent in central and southern Italy and the Italian islands. It appears to cause little, if any, damage, even when infection is severe.

Abbott (E. V.). **Comparison of methods for artificially inoculating Sugar-Cane seedlings with the mosaic virus.**—*Phytopathology*, 39, 8, pp. 668–669, 1949.

An account is given of experiments carried out at the United States Sugar Plant Field Station, Houma, Louisiana, to compare the efficiency of Bain's rapid and economical abrasion technique with Matz's needle-prick method for the inoculation of sugar-cane seedlings with the mosaic virus [*R.A.M.*, 24, p. 121], using clones of the very susceptible Co. 281 and Co. 290. The following percentages of infection were obtained by the abrasion technique: Louisiana Purple, 100, Co. 281, 89, and Co. 290, 86, as against 89, 60, and 44, respectively, with the needle-prick method. The former procedure has now been adopted for the routine inoculation of seedlings at the Station, but with older plants the needle-prick method is more effective. It has been found that some clones become infected by the abrasion technique which would be resistant to the needle-prick method or to exposure to natural sources of the virus [ibid., 28, p. 310]. This fact, however, is not a valid objection to the practice of abrasion, since the annual surplus production of seedlings in the breeding programme necessitates a certain number of rejections in any case. Although inoculation of the seedlings in the germination flats was shown to be practicable, thereby saving the labour and greenhouse space required for potting the several thousand ultimately to be eliminated, this method was not adopted for general use, since it is difficult to avoid uprooting some seedlings and virtually impossible to apply uniform treatment to all.

Saint (S. J.). **Fourteenth Annual Report of the British West Indies Central Sugar Cane Breeding Station, Barbados, for the year ending September 30th, 1947.**—45 pp., [? 1948. Received October, 1949.]

It is stated in this report [cf. *R.A.M.*, 27, p. 157; 28, p. 488] that when sugar-cane seedlings of the 13–44 series were tested for resistance to mosaic [virus] disease by artificial inoculation in dry weather only two varieties showed any symptoms, and plants of Ba 11569 also took very badly. Of the two well established commercial sugar-cane varieties grown in Jamaica B 34104 [ibid., 28, p. 545] is very susceptible to a mild form of mosaic, but this does not appear to affect its yield, while B 3439 is highly resistant to mosaic. In trials B 37161 is equal to B 34104, is more resistant, and also shows a high degree of tolerance.

SAINT (S. J.). **Fifteenth Annual Report of the British West Indies Central Sugar Cane Breeding Station, Barbados, for the year ending September 30th, 1948.**—38 pp., [? 1949].

In this report [see preceding abstract] it is stated that in Jamaica the sugar-cane variety B 41227 appears to be very highly resistant to mosaic virus disease and outyielded B 34104 by 20 per cent. on sugar production in a single test. B 3439 and B 37172 are resistant varieties with excellent juice, and the latter is being grown on a large scale.

In Barbados none of five one-eye cuttings of each variety of the B 45 series of seedlings inoculated with B 2935 material when 15 in. tall showed mosaic symptoms after four months. At the same time only 10 of 100 healthy Ba 11569 plants inoculated became diseased. It appears therefore that the mosaic virus from this source may be losing its virulence, and tests are planned by the method reported from Puerto Rico whereby the virulence of the virus is increased by passing it through sorghum.

RAPER (K. B.) & THOM (C.). **A manual of the Penicillia.**—ix+875 pp., 172 figs., 10 col. pl., London, Baillière, Tindall & Cox, 1949. £4. 11*s.* 6*d.*

This book provides the mycologist with a most valuable, up-to-date means of identifying the species of *Penicillium*. It is designed on lines similar to those of the same authors' 'Manual of the Aspergilli' [*R.A.M.*, 25, p. 141].

The system of classification employed by Thom in 'The Penicillia' [ibid., 9, p. 410] has been retained. One hundred and thirty-seven species and four varieties (one of which is new) are accepted as valid. A general, diagrammatic key to the main groups leads to detailed keys for each series of species. Preliminary chapters cover the history of the genus, diagnosis and synonymy, observation and description, and cultivation and preservation. There is also a chapter on penicillin, including accounts of methods of production and the selection of high yielding strains of *P. notatum* and *P. chrysogenum*. The extensive bibliographies are divided into general and topical sections.

A large number of illustrations add considerably to the usefulness of the manual. The majority are photographic and are in general of good quality, but line drawings, of which there are too few, could have replaced, with advantage, some of the photomicrographs.

CUNNINGHAM (G. H.). **New Zealand Polyporaceae.**—*Bull. Dep. sci. industr. Res. N.Z.* 81, 24 pp., 1949.

This is an annotated list of 130 valid species of New Zealand Polyporaceae, including revisions of some previously published [cf. *R.A.M.*, 28, p. 361].

ARX (J. A. v.). **Beiträge zur Kenntnis der Gattung Mycosphaerella.** [Contributions to the knowledge of the genus *Mycosphaerella*.]—*Sydowia*, 3, 1–6, pp. 28–100, 24 figs., 1949.

The genus *Mycosphaerella* is characterized by asci containing eight bicellular, hyaline spores. It comprises well over 1,000 species. The author discusses its systematic position and its relation to other genera of the Mycosphaerellaceae. Among the 20 species described in detail in this critically annotated study may be mentioned the type species *M. tassiana*; *M. martagonis* n.sp. (*Cercosporella hungarica*) [*R.A.M.*, 8, p. 151], with ovoid to clavate, sessile or shortly stipitate asci, 32 to 45 by 11 to 14 μ, and elongate to fusoid or subclavate, mostly straight ascospores, 20 to 28 by 3 to 4·5 μ, on *Lilium martagon* near Zürich; and *M. limbalis* (Pers.) n. comb., synonyms of which include *Phyllosticta limbalis* and *Sphaerella patouillardi* [ibid., 25, p. 194].

Wehmeyer (L. E.). **Studies in the genus Pleospora. I.**—*Mycologia*, 41, 5, pp. 565–593, 17 figs., 1949.

This paper is the first of a series, in which an attempt will be made to group various collections of the genus *Pleospora* from many sources into workable species and to find the proper binomials for these groups. Descriptions are given here of collections of the simpler types, which illustrate the origin of the main lines of development within the genus. It includes 17 species, one of which is new. *Pleospora trichostoma* is considered the valid name of the fungus fairly common on stems of *Poa*, rye, and wheat, which has large, pale olive brown, triseptate ascospores and large stromatic, setose perithecia. *Pyrenophora teres* is given as a synonym.

Jackson (H. S.). **Studies of Canadian Thelephoraceae. IV. Corticium anceps in North America.**—*Canad. J. Res.*, Sect. C, 27, 5, pp. 241–252, 3 pl., 1 fig., 1949.

In a further contribution to this series [cf. *R.A.M.*, 28, p. 32] the author describes the parasitic basidiomycete, previously referred to *Corticium anceps* [ibid., 12, p. 132; 14, p. 797], commonly found on a large number of hosts in the Timagami Forest Reserve, Ontario. The same species occurs in Quebec and in Maine, New Hampshire, New York, and Wisconsin. Basidia of the same fungus were found on a number of herbarium collections of *Sclerotium deciduum* Davis (J. J. Davis, *Trans. Wis. Acad. Sci.*, 19, p. 689, 1919). Since the fungus is a delicate corticioid form, whose holobasidia are divided into hypo- and epibasidia, and it has the habit of basidiospore germination by repetition, the author transfers it to the genus *Ceratobasidium* [ibid., 28, p. 32] as *C. anceps* n. comb. The symptoms of the disease on ferns correspond to those described on bracken. On angiosperms the symptoms described from herbarium specimens are necrotic areas, which vary in size, shape, and colouring on the different species attacked. The presence of mycelial pads or sclerotia developing on the necrotic tissue serve to distinguish the fungus from similar species. The presence of appressorial pads on necrotic lesions of a host is apparently indisputable evidence of the parasitic phase. Cultures from six different hosts did not vary appreciably. Sclerotia were formed, but no basidia.

In Europe and Great Britain the fungus is recorded only on ferns, whereas in the regions of North America cited 48 dicotyledons and 7 monocotyledons in addition to 11 fern species are reported as hosts. Infections of the fungus in the field have been observed passing from one host to another where the foliage was in contact. Controlled inoculation experiments are needed, using cultures from North America and Scotland. In preliminary culture inoculation experiments incipient necrotic lesions and appressorial pads developed on bean (*Phaseolus vulgaris*), tomato, and maize. Transference of the disease by applying diseased leaves to healthy foliage was also obtained. The type of parasitism of the fungus is discussed and the current views on its nuclear history questioned.

Moreau (C.). **Micromycètes africains. I.** [African microfungi. I.]—*Rev. Mycologie, Suppl. colon.*, 14, 1, pp. 15–22, 4 figs., 1949.

Ten new or little known fungi collected in Africa and deposited in the Laboratoire de Cryptogamie of the Muséum National d'Histoire Naturelle are described. *Leptosphaeria sacchari* [*R.A.M.*, 17, p. 839; cf. 26, p. 335] causes severe damage to sugar-cane leaves in Madagascar and reduces the vitality of the plant; it is widespread in the [British West] Indies and in India; *L. penniseti* [ibid., 20, p. 596], *Phyllachora penniseti* [ibid., 27, p. 158], and *Stagonospora penniseti* n.sp. are the agents of leaf spots of *Pennisetum purpureum* in French Guinea, and *Cercospora calotropidis* of those on *Calotropis procera* [ibid., 25, p. 542] in Senegal.

Petrak (F.). **Beiträge zur Pilzflora Irans.** [Contributions to the mycoflora of Iran.] —*Sydowia*, 3, 1–6, pp. 268–332, 1 pl., 1949.

Among the fungi comprised in this critically annotated study of material collected by Dr. K. H. Rechinger during a botanical expedition through Persia from April to September, 1948 [cf. *R.A.M.*, 26, pp. 131, 173; 28, p. 378], may be mentioned *Aecidium haussknechtianum* on barberry leaves [ibid., 18, p. 741], *Puccinia carthami* on *Carthamus oxyacanthus*, and *Seynesiella juniperi* on juniper. The list contains one new subgenus and 24 new species.

Ling (L.). **Taxonomic notes on Asiatic smuts—I.**—*Sydowia*, 3, 1–6, pp. 123–134, 1949.

This initial instalment of a proposed revision of the Ustilaginales of Asia and the adjacent Pacific Islands comprises 29 species, including *Sorosporium cynodontis* n.sp. on *Cynodon dactylon*, which is characterized by cylindrical sori involving the entire inflorescence, 0·6 to 2 cm. by 2 to 3 mm.; evanescent, subglobose, ellipsoid or oblong, opaque spore balls, 40 to 78 by 30 to 52 μ; and globose to broadly ellipsoid, often somewhat angular spores, 10·5 to 16·5 by 9 to 13·5 μ, with a deep reddish-brown, verrucose membrane, 1·5 μ in thickness, the inner spores paler. There are five other new species and seven new combinations.

Scaramuzzi (G.). **'Avvizzimento' del Tabacco da Fusarium oxysporum Schl. var. nicotianae Johns.** [Tobacco 'wilt' caused by *Fusarium oxysporum* Schl. var. *nicotianae* Johns.]—*Notiz. Malatt. Piante*, [*1949*], 3, pp. 12–13, 1949. [Mimeographed.]

From the stems of wilted Burley tobacco growing near Pavia the author isolated a fungus which in culture produced conidia, chlamydospores, and abundant dark blue, almost black, sclerotia, characteristic of *Fusarium oxysporum* var. *nicotianae* [*R.A.M.*, 27, p. 48; 28, p. 327]. When pieces of culture were placed in soil in which Burley tobacco was growing the seedlings developed typical wilt in about one month, infection in most cases proving fatal.

Lucas (G. B.). **Studies on the morphology and cytology of Thielavia basicola Zopf.**—*Mycologia*, 41, 5, pp. 553–560, 1 fig., 1949.

This study is concerned mainly with the morphology and cytology of an isolate of *Thielavia basicola* [*R.A.M.*, 27, p. 298] from tobacco roots, but four isolates from other sources (including Austrian winter pea and soy-bean) were also investigated. The fungus is widespread in the soil and there are various strains. The production and size of perithecia and size of ascospores appear to be dependent on the source of the isolate and the substratum on which it grows. Ascospores produced in culture are usually larger than those in tobacco roots. The author has observed *T. basicola* only on tobacco roots which had been infected with *Thielaviopsis basicola*.

Shaw (C. G.). **Peronospora tabacina in Washington State.**—*Phytopathology*, 39, 8, pp. 675–676, 1949.

Briefly discussing the nomenclature of the causal organism of tobacco blue mould in the light of Clayton and Stevenson's studies [*R.A.M.*, 14, p. 657; 22, p. 279], the author concludes that *Peronospora nicotianae* Speg. is a *nomen confusum*, being based on the conidiophores and conidia of the fungus now generally termed *P. tabacina* and the oospore-like bodies of some other species. The oospores of a downy mildew recently collected on *Nicotiana attenuata* in Washington State measure 40 to 57 μ in diameter, with a mean of 47·2 μ, thus approximating closely

to those of *P. tabacina* (35 to 60, mean 46 μ). Even more important is the fact that the exospore definitely places the new collection in the section *Effusae* of the genus *Peronospora*, whereas the oospores present in Spegazzini's material should be referred, on the basis of exospore structure, to the section *Calothecae*. The Washington specimen is consequently identified as *P. tabacina*, thereby supporting the hitherto dubious opinion that earlier western collections also belonged to this species. It is still uncertain whether *P. tabacina* was originally endemic in all the three areas where species of *Nicotiana* are native (North and South America and Australia), or whether it has spread from one to the others.

Van Schreven (D. A.). **Onderzoekingen met betrekking tot enkele plagen en ziekten van Vorstenlandse Tabak.** [Investigations on certain pests and diseases of Vorstenland Tobacco.]—*Tijdschr. PlZiekt.*, 54, 5–6, pp. 149–174, 5 figs., 1 diag., 1 graph, 1948. [English summary.]

The investigations described in this report were carried out at the Vorstenland (Java) Tobacco Experiment Station from 1940 to 1942. All the sap-transmissible tobacco viruses occurring locally were found to succumb to solutions of 8 per cent. trisodium phosphate plus 4 per cent. green soap, or 12 per cent. trisodium phosphate [*R.A.M.*, 20, p. 279]. An effective substitute during the war for the disinfection of workers' hands was found in 'mimosa extract', a tanning substance derived from *Acacia decurrens* bark, used at a strength of 15 per cent. Contamination of the solution by micro-organisms was prevented by the addition of 0·02 per cent. terbolan [ibid., 19, p. 220] or cryptonol [ibid., 23, p. 91].

The regular examination, by Holmes's leaf-testing method [ibid., 11, p. 333], of soil samples heavily contaminated by tobacco mosaic virus, kept in tins at different moisture contents, showed that the infective principle remains active for more than a year under these conditions [ibid., 16, p. 499]. However, during the experimental period the number of lesions produced by inoculation on the leaves of a *Nicotiana glutinosa* × *N. glauca* hybrid decreased substantially, especially when soils were held at relatively low moisture contents as compared with inundated samples.

Vorstenland plantations often sustain extensive damage from the distorting form of the tobacco mosaic virus [ibid., 16, p. 414], of which there are three strains. The most severe, the green distorting mosaic, was shown to be transmissible from chilli and cucumber to tobacco by the aphid *Myzus persicae*. A mild strain of distorting mosaic was transmissible from cucumber to tobacco by *Aphis gossypii*, which does not thrive, however, on the latter host.

The resistance of tobacco to slime disease (*Pseudomonas* [*Xanthomonas*] *solanacearum*) was tested by dipping seedling roots before planting in a suspension of macerated young plants infected by the pathogen. By this method a highly resistant strain (the progeny of a Sumatran R-line hybrid which had survived the previous year's inoculation) was obtained, 60 per cent. of the seedlings withstanding the treatment, whereas 100 per cent. of the ordinary varieties were killed within a month. *X. solanacearum* in infested soil in flower pots buried up to the rim in inundated soil at planting time was inactive, whereas tobacco mosaic virus was still infective; after crop harvest both were still infective in pots buried in the retaining banks. Slime disease infection in a tobacco crop following rice does, in fact, often originate on the sites of the old retaining banks after levelling. Vorstenland growers have now been advised not to remove the banks after rice cultivation. These observations and experiments demonstrate the beneficial effect of a wet rice culture in the elimination of *X. solanacearum*, so that tobacco can be grown locally in a biennial rotation alternating with wet rice as compared with the eight-year period necessary for the decontamination of non-irrigated soil in Deli, Sumatra [cf. ibid., 4, p. 318].

An isolate of *P.* [*X.*] *campestris* from cabbage, inoculated into tobacco leaves kept in Petri dishes at 100 per cent. relative humidity, induced symptoms resembling those caused by *Bacillus* [*Erwinia*] *aroideae* [ibid., 16, p. 780]. It was unable, however, to infect growing tobacco plants.

The examination of large numbers of soil and stable manure samples for the presence of *Phytophthora parasitica* var. *nicotianae* by Thung's leaf-testing method [ibid., 18, p. 420] showed that at least three species of *Pythium* were also capable of causing lesions. The method must therefore be supplemented by the microscopic study of lesion fragments after a period of not less than 24 hours in distilled water.

A technique has been devised for testing the resistance of tobacco to *Cercospora nicotianae*, using spore suspensions from leaf spots, which were removed by means of a small cork-borer and shaken with water. Drops of the suspensions were applied to one half of each leaf. One man with an assistant can inoculate about 100 leaves an hour with 30 to 40 drops each, so that the method is applicable to large-scale field trials; 1 l. spore suspension at 30 drops per half leaf is enough for 1,400 leaves. The operation should be performed on leaves within two to three weeks of maturity. Under favourable weather conditions the leaf spots appear in eight to ten days, otherwise a period of three or four weeks may elapse before their development. In 1940 the Timor-Vorstenland variety reacted to this method of inoculation by the formation of necrotic lesions surrounded by a broad, yellow zone gradually merging into green. This type of spotting has commonly been attributed to *Alternaria longipes* [ibid., 19, p. 497], but inoculation with a culture of the latter resulted in the development of concentrically zonate lesions, the dead tissues of which later fell out. Tested by the new method, the leaves of mosaic-diseased Kanari tobacco plants were found to be much more susceptible than healthy ones. After about 20 days 800 spots developed on 60 leaves of ten plants compared with some 350 on healthy ones after 22 days. The leaf tips are particularly susceptible to infection by *C. nicotianae*, and the spraying of one surface with Bordeaux mixture is no protection against inoculation on the other. Evidence was obtained indicating that the spores are air borne.

Knight (C. A.). **The nature of some of the chemical differences among strains of Tobacco mosaic virus.**—*J. biol. Chem.*, 171, 1, pp. 297–308, 1 pl., 1 fig., 1947. [Received 1949.]

Chemical and microbiological assays for 19 amino acids were made at the Department of Animal and Plant Pathology of the Rockefeller Institute for Medical Research, Princeton, on highly purified preparations of eight strains of tobacco mosaic virus [cf. *R.A.M.*, 29, p. 58]. Holmes's rib-grass (*Plantago*) strain [ibid., 22, p. 278; 27, p. 161] was found to contain histidine and methionine, which are entirely absent in the other seven strains. In addition, 38 quantitative differences in one amino acid or another were found among the strains. No chemical difference, however, could be detected between ordinary tobacco mosaic virus and Holmes's masked strain [ibid., 13, p. 399] or between the green and yellow aucuba strains which are undoubtedly closely related to the type strain. In general those strains which, from biological properties, appeared to be most distantly related to the type strain, e.g., the rib-grass strain and cucumber viruses 3 and 4 [? cucumber green-mottle mosaic virus: ibid., 27, p. 162], showed the most marked differences in protein composition. One strain, J 14 D, which is believed to have arisen from the type strain by two mutations or variations, was found to differ in composition from the type strain in only two respects. It is suggested that, in some cases at least, mutation among tobacco mosaic viruses involves stepwise changes in amino acid content.

Takahashi (W. N.) & Rawlins (T. E.). **The length of Tobacco mosaic virus particles from juice and from leaf residues.**—*Phytopathology*, 39, 8, pp. 672–675, 1 graph, 1949.

Electron micrographs at the University of California, Berkeley, showed that about 70 per cent. of mosaic virus particles from tobacco leaf juice [*R.A.M.*, 26, p. 174; 29, p. 59] fell in the 'middle' group [see next abstract] with a mode of approximately 300 mμ, and the bulk of the remainder in the 'short' one (under 231 mμ). In the leaf residue, on the other hand, about 70 per cent. of the particles are short and 30 per cent. of medium length. Gaw's conclusion that the tobacco mosaic virus particles are of essentially the same length in juice and residue (*Arch. Ges. Virusforsch.*, 3, pp. 347–355, 1947) led to a study of his micrographs, which showed that 15 to 60 per cent. of the particles are longer than 446 mμ, apparently as a result of aggregation due to his methods of preparation. In agreement with other workers, the authors found that most or all of the infectivity of the virus resides in the medium-length particles [*R.A.M.*, 26, p. 268], those of the short group apparently representing a stage devoid of virulence when removed from the host.

Kahler (H.) & Woods (M. W.). **Electron microscopic and electrophoretic study of two strains of Tobacco mosaic virus.**—*Arch. Biochem., N.Y.*, 22, 3, pp. 393–401, 6 figs., 1 graph, 1949.

Two strains of tobacco mosaic virus, viz., 2 A (a typical green mosaic strain) and the new 1 C [*R.A.M.*, 28, p. 250], were examined under the electron microscope and found to approximate to the normal length of 280 by 15 mμ [see preceding abstract]. The frequency distribution of lengths in material prepared by a chemical method [ibid., 23, p. 163] did not differ appreciably from previously published data obtained with samples prepared by centrifugation. Both strains of the virus became aggregated end-to-end when exposed to the action of various salts. The aggregation of strain 2 A was effected more rapidly at 26° than at 4° C. A pooled sample was fractionated and the two components produced their characteristic lesions on Maryland medium broadleaf tobacco leaves inoculated by rubbing.

On the one hand, the similarity between the two strains in size and linear aggregation rate suggests comparable structures at the ends of the particles, but on the other, the higher electrophoretic mobility of 2 A indicates a diversity of structure affecting total surface charge.

Bennett (C. W.) & Costa (A. S.). **The Brazilian curly top of Tomato and Tobacco resembling North American and Argentine curly top of Sugar Beet.**—*J. agric. Res.*, 78, 12, pp. 675–693, 5 figs., 1949.

Evidence obtained in studies carried out in 1946–7 at the Instituto Agronômico, Campinas, Brazil, is presented, indicating that the rugose form of a tobacco disease resembling leaf curl [*R.A.M.*, 19, p. 305] and a tomato virus disease described by Kramer [ibid., 27, p. 203] occurring throughout the State of São Paulo, Brazil, are caused by the same virus, and the name Brazilian curly top is suggested. In some seasons 10 to 20 per cent. of tomato plants in individual plantings are affected. The incidence of the disease appears to be higher during the winter. Up to 6 per cent. of tobacco plants were found infected, but mostly the disease is limited to a few plants per acre. In addition, the disease was observed on buckwheat and spring bur (*Acanthospermum hispidum*), the latter a common weed of cultivated fields and most important breeding host for the insect vector, *Agallia albidula* [loc. cit.].

The insect transmitted the virus to a wide range of plants, including tobacco, tomato, spinach, sugar beet, flax, *Zinnia elegans*, *A. hispidum*, and *Datura stramonium*. The symptoms on these hosts closely resemble those produced by sugar

beet curly top in North America [ibid., 28, p. 105], but sugar beet is more resistant to the Brazilian curly top and suffers less serious injury. The disease was transmitted by grafting but not by juice inoculation.

A. albidula was found on a wide range of host plants. The minimum incubation period in the vector appears to be 24 hours, but more infections were obtained after 48- or 96-hour periods. The virus is retained in the insects for considerable periods, but when individual leafhoppers were successively transferred to fresh healthy plants, the virus tended to become exhausted, which indicates that it does not multiply in the vector. Viruliferous leafhoppers vary considerably in their ability to transmit the virus. In some cases they retained the virus for 42 to 85 days when kept on plants immune from the disease. Progeny of these insects reared on immune plants did not transmit the virus. The virus was precipitated from the juice of spinach in 50 per cent. alcohol and recovered by non-viruliferous leafhoppers that fed on a suspension of the precipitate.

Because of the similarity in host range and in symptoms on various hosts it is suggested that this virus is related to the sugar beet curly top virus of the United States and to the curly top virus of Argentina [ibid., 25, p. 245], and it should be tentatively classified as a variety of the curly top virus complex of the Western Hemisphere. According to Holmes's system of classification and nomenclature [ibid., 28, p. 514] the name *Ruga verrucosans* var. *brasiliensis* n. var. is proposed.

LOEST (F. C.). **Bacterial canker of the Tomato.**—*Fmg S. Afr.*, 24, 282, pp. 393–394, 412, 3 figs., 1949.

Bacterial blight (*Corynebacterium michiganense*) of tomato was first observed in South Africa in October, 1948 [*R.A.M.*, 28, p. 551] and in certain areas of the Transvaal the losses have been very heavy. To prevent spread of both the virulent and milder form of the disease in South Africa, farmers are urged to use only South African produced, Government certified seed. A summary of control measures is given.

Plant diseases.—*Agric. Gaz. N.S.W.*, 60, 8, pp. 419–423, 9 figs., 1949.

Dr. LILIAN FRASER contributes a paper on 'Shatter—a virus disease of tomatoes'. During the summer of 1942–3 tomato plants in a crop growing in the Windsor District became affected by a disease apparently of virus origin. The condition was rather prevalent in the Windsor-Richmond area, over 50 per cent. of the plants in some crops being affected, and it was also noted at Burragorang, Woodville, and Dubbo, and the following summer at Armidale, Canberra, and Maitland. Since then it has appeared sporadically in the same areas, affecting young plants most severely.

Affected plants, which are scattered throughout the crop, have small, dark brown, roughly circular or angular, irregular necrotic areas between the main veins, while necrotic streaks up to 2 mm. or more in length may border the main or lateral veins. The necrotic areas are usually most numerous towards the base of the leaflets. The petioles of affected leaflets and the main stem adjacent to them develop necrotic streaks and blotches. Brown areas are present in the cortex and pith, especially at the nodes. Two to four leaves, immature at the time of infection, develop the symptoms, together with leaves of similar age on lateral shoots. The virus appears to die out soon after infection. Affected leaves continue growth and the necrotic spots split, giving the mature leaf a 'shattered' appearance. Subsequent growth is normal, leaving a cluster of curled, torn leaves, and a slightly distorted, roughened stem below. Fruit symptoms, observed only once, consisted of irregular, skin-deep, necrotic blotches with some approximation to broad rings occasionally.

The weeds *Datura stramonium* and *Nicandra physaloides*, common locally, also often develop an oak-leaf, necrotic line pattern on the fading leaves. The virus was readily transmitted by grafting from tomato plants showing early symptoms to seedlings of tomato and *D. stramonium*.

Notes are also given on the control of *Actinomyces scabies* and *Rhizoctonia* [*Corticium*] *solani* on potatoes [*R.A.M.*, 27, p. 193] by planting healthy tubers, disinfection of the seed pieces, crop rotation, and the avoidance of applications of lime.

Tomato leaf mould [*Cladosporium fulvum*: ibid., 28, pp. 270, 493] is uncommon on outdoor crops in New South Wales (except in seasons of abnormally high humidity) in areas not in the immediate vicinity of glasshouses. It is, however, a major disease of glasshouse crops. Much can be done to diminish the severity of the disease by proper ventilation, and growers should endeavour to maintain the desired degree of warmth and at the same time reduce atmospheric humidity as much as possible. Spraying is essential, and the best results have been obtained (locally) when fungicides containing salicylanilide have been applied to the whole plant, particularly the lower surfaces of the leaves. To be effective sprays must be applied every 14 days throughout the season.

Day (W. R.). **A note on canker development in Poplars and Willows.**—*Ned. Boschb. Tijdschr.*, 20, 11, pp. 323–330, 5 figs., 1948. [Dutch summary.]

In two pathological conditions of cricket bat willow *Salix alba* var. *coerulea* in England, known as 'bar stain' or 'butterfly mark' and 'hidden canker', the necrotic area of the cambium is occupied by abnormal woody tissue, which develops while the first xylem elements are forming in the spring and may extend widely in a radial direction. The damage occurs here and there on the stems, often at the site of old pruning wounds. The simplest explanation of the phenomenon is the local action of frost.

In the case of willow the foregoing symptoms are not associated with bacteria or fungi, but *Pseudomonas rimaefaciens* is present in the cankers of identical symptomatology, on the corresponding areas of poplar stems, as already shown by De Koning in Holland [*R.A.M.*, 17, p. 492]. The material examined by the author originated on × *Populus generosa* in a part of Herefordshire where severe frosts are prevalent and on × *P. eugenei* near Oxford. Typical features of frost damage are the necrotic, brown, split, and collapsed bark and the split medulla. It is suggested that these injuries provide the means of ingress for *Pseudomonas rimaefaciens* and attendant bacteria and fungi, including *Nectria* spp. These observations have an important bearing on the work of breeding for disease resistance, since they point to the advisability of testing new hybrids for their reaction to frost [ibid., 27, pp. 501, 590].

Banti (G.) & Orsenigo (M.). **Inchiesta sulla diffusione del 'cancro americano' del Castagno (Endothia parasitica (Murr.) And.). I. Provincia di Varese.** [Survey of the distribution of 'American canker' of Chestnut (*Endothia parasitica* (Murr.) And.). I. Province of Varese.]—*Notiz. Malatt. Piante*, [*1949*], 3, pp. 19–21, 1 map, 1949. [Mimeographed.]

Chestnut canker (*Endothia parasitica*) [*R.A.M.*, 28, pp. 200, 428] was first reported from the region of Varese in north Italy in February, 1949, since when the disease has spread locally with much rapidity. Infection is serious and appears to be highly virulent. Most of the affected trees bear large cankers and soon wilt; in the affected district all the chestnut trees are attacked. Already, all the eastern half of the province of Varese is affected, comprising 50 of the 115 communes in the province. Details of the incidence of the outbreak are tabulated.

Bier (J. E.). **Some common tree diseases of British Columbia.**—48 pp., 21 pl., Ottawa, Dominion of Canada, Department of Agriculture, 1949.

In this handbook the more common and most serious diseases of trees (mostly conifers) caused by fungi and dwarf mistletoes (*Arceuthobium campylopodum*) in British Columbia [cf. *R.A.M.*, 28, p. 430] are described and illustrated with some notes on control. A host index is given.

Luttrell (E. S.). **Scirrhia acicola, Phaeocryptopus pinastri, and Lophodermium pinastri associated with the decline of Ponderosa Pine in Missouri.**—*Plant Dis. Reptr*, 33, 10, pp. 397–401, 1949. [Mimeographed.]

Observations made from 1947 to 1949 in a plantation located in the University of Missouri Arboretum and Wildlife Area, near Ashland, Missouri, indicated that a serious decline of 12- to 14-year-old ponderosa pines (*Pinus ponderosa*) was associated with *Scirrhia acicola* [*R.A.M.*, 20, p. 185; 23, p. 505], which appeared to be the principal agent, while *Phaeocryptopus pinastri* [ibid., 17, p. 638] and *Lophodermium pinastri* [ibid., 23, p. 377] were of secondary importance. All ponderosa pines were affected, defoliation being slight on the larger, and complete on the smaller trees. The stunting and death of the trees appeared to be the result of severe defoliation during successive years. Other kinds of pine in the plantation were not attacked. *P. pinastri* and *L. pinastri* often fruited on the dead tissue of needles along with *S. acicola*, which usually produced acervuli soon after the death of the tissue, but sometimes the first two were found without the last. *P. pinastri* was also observed on a few green needles. On fallen needles the apothecia of *L. pinastri* were more abundant than the ascocarps of *S. acicola*. It is suggested that *P. pinastri*, while normally a saprophyte, may become pathogenic on pines planted as exotics. Full descriptions of the three organisms are given.

Verrall (A. F.). **Some molds on wood favored by certain toxicants.**—*J. agric. Res.*, 78, 12, pp. 695–703, 4 graphs, 1949.

To determine the effect of certain chemical treatments on mould development in pine timber, field tests were carried out in co-operation with the Southern Forest Experiment Station with small pieces of fresh green sapwood, dipped for about 10 seconds in aqueous solutions of various fungicides, piled in miniature air-seasoning piles, covered, and exposed to natural infections. The results showed moulds were outstandingly more prevalent and luxurious on treated than on untreated wood and that borax favoured the development of smoky grey mould (*Alternaria* sp.), cupric, magnesium, sodium, and zinc silicofluorides and tartar emetic *Trichoderma viride*, ethyl mercuric phosphate and phenyl mercuric acetate *Penicillium cyclopium* [*R.A.M.*, 9, p. 784], and urea both *Trichoderma* and *Penicillium*.

In laboratory tests there was a significant increase of *P. cyclopium* on green sapwood blocks of longleaf pine (*Pinus palustris*) and loblolly pine (*P. taeda*), treated with ethyl mercuric phosphate and 24 hours later inoculated with the fungus, compared with the untreated ones, the extent and luxuriance of the mould growth increasing with higher concentrations up to 0·015 per cent. of that used commercially for stain control. Even at four times this concentration there was more *P. cyclopium* on the treated than on the untreated. Stain due to *Ceratostomella pilifera*, however, was much less on treated wood. Similarly, *T. viride* grew significantly more on wood treated with sodium fluoride up to 2 per cent., while staining was considerably less. When blocks were sterilized before treatment mould development decreased with increasing concentration. Sterilized untreated blocks were as mouldy as the treated, unsterilized ones. The increased growth on treated blocks may be partly due to the elimination of competing organisms by the

fungicides. The results show that these moulds are highly tolerant of the fungicides used. Very low concentrations of the mercurial actually stimulated the development of *P. cyclopium*, even in pure culture.

[Magoon (C. A.)]. **Breeding better vegetables for the South at the U.S. Regional Vegetable Breeding Laboratory.**—*Misc. Publ. U.S. Dep. Agric.* 578, 34 pp., 10 figs., 1 map, 1945. [Received April, 1949.]

The following items are of interest in this report. It is stated that bean [*Phaseolus vulgaris*] powdery mildew [*Erysiphe polygoni*] and mosaic virus are no longer a menace to the grower as all the new varieties developed by the United States Regional Vegetable Breeding Laboratory, South Carolina, are highly resistant to both. While no type or strain of tomato showing marked resistance to *Alternaria solani* [*R.A.M.*, 26, pp. 36, 176; 28, pp. 118, 255] has been found, a high degree of resistance to the collar rot stage of the disease has been observed in medium-sized Danish and English forcing tomatoes, such as Devon Surprise, and in strains of *Lycopersicon pimpinellifolium* and *L. esculentum* var. *cerasiforme*. Steps have been taken to incorporate this resistance into newly bred lines. Considerable tolerance to *Septoria lycopersici* [ibid., 28, pp. 36, 54, 255] was found in a single small-fruited segregate from the Targinnie Red variety received from Australia, and breeding work employing this source of resistance is already well advanced [ibid., 28, p. 648]. Resistance to *Cladosporium fulvum* [ibid., 27, pp. 164, 543; 28, p. 599] has been found in several tomato breeding lines. Crosses between Vetomold and Pan America have resulted in a tomato that shows high promise as a resistant breeding line [cf. ibid., 29, p. 87].

A very effective method for inoculating test plants is described. The disease-producing fungus is grown on a liquid nutrient medium in culture, then reduced to a uniform consistency by means of an electric homogenizer. The suspension is then diluted with water. The test plants, either in greenhouse flats or 4 in. pots, three plants per pot, are inoculated four weeks after seeding by immersing the tops in the fungus suspension. With foliage diseases, the inoculated plants are placed in a moist chamber, while for collar rot and root inoculations the plants are placed in warm soil beds. This 'dunking' method is particularly helpful when thousands of plants have to be handled.

Bennett (C. W.). **Some unreported hosts of Sugar Beet mosaic virus.**—*Phytopathology*, 39, 8, pp. 669–672, 1 fig., 1949.

Three species of plants, apparently not hitherto recorded as hosts of sugar beet mosaic virus [cf. *R.A.M.*, 27, p. 345], were found naturally infected in southern California fields, namely, *Amaranthus retroflexus*, *Melilotus indica*, and crimson clover (*Trifolium incarnatum*). The disease was transmitted experimentally by means of *Myzus persicae* [ibid., 28, p. 610] from sugar beet to these species, as well as to the following, also apparently new hosts: *Beta patellaris*, *Browallia speciosa*, *Nicotiana quadrivalvis* and its var. *multivalvis*, *N. clevelandi*, *Phacelia campanularia*, Little Gem garden pea, and *Samolus parviflorus*. Sugar beets were infected from each of these plants by juice inoculation.

Unsuccessful attempts were made to inoculate *Datura meteloides*, *D. stramonium*, tomato, and various species of *Nicotiana* with grafting material from diseased plants of *N. clevelandi* and *N. quadrivalvis*. A number of other plants reacted negatively to repeated infestation with *M. persicae* from mosaic sugar beets.

The symptoms of the disease on the susceptible hosts in these studies consisted of various types of mottling roughly corresponding to those found on sugar beet. On *Melilotus alba* chlorosis was limited to the veins and contiguous tissue in some leaves but assumed various forms of mottling in others. Crimson clover plants were dwarfed and the leaves were deformed and showed some necrosis besides

mottling and vein chlorosis. A common mottling pattern, with little or no foliar dwarfing and no deformity, developed on *N. clevelandi* and *N. quadrivalvis*. Necrosis was the first symptom on *S. parviflorus*, followed by a measure of recovery and mottling. The foliage of *Beta patellaris* was stunted, mottled, and deformed, but in many of the plants only one or a few shoots were involved. Local necrotic lesions, 2 to 4 mm. in diameter, were produced in sufficient numbers on leaves rubbed with juice from diseased plants to be of use in studies on properties of the virus. Similar lesions developed on inoculated leaves of Detroit Dark Red garden beets.

A fairly high percentage of infection was found on *M. indica* in most places where it was growing in proximity to diseased sugar beets, and the same was observed in fields near Tucumán and Conesa, Argentina, 1941. Crimson clover used as a cover crop in plots near mosaic sugar beets at Hemet, California, was rather heavily infected in 1943. However, neither these plants nor any of the susceptible weed hosts appear to act as important sources of infection for sugar or garden beets. There is strong evidence to show that the virus is introduced into new fields mainly from older diseased beets left or planted in the vicinity.

Hartsuijker (K.). **De vergelingsziekte der Bieten.** [Beet yellows disease.]—*Maandbl. LandbVoorl.*, 6, 3–4, pp. 166–169, 1949.

The reduction in the sugar yield of beets attacked by the beet yellows virus in Holland [*R.A.M.*, 26, p. 179], due to the occlusion of the sieve-tubes by a gummy substance, may amount to between 25 and 30 per cent. in cases of early, generalized infection, such as occurred in the south-west in 1945 and 1947. Overwintering beets are the sole important source of perpetuation of the virus, which was shown by five years' consecutive investigations to survive the winter, together with its insect vector the peach aphid (*Myzus persicae*), in fodder beet clamps [ibid., 28, p. 620]. Field observations, notably in 1948, clearly demonstrated the emanation of infection from these clamps, and an essential control measure consists in their early clearance (by 1st April at the latest) and burial. Isolated plants infested from clamps may be observed in the fields during the latter half of June and first week of July, after which the incidence of the disease will depend entirely on the number of aphids produced in a given year. Their multiplication is in turn governed by weather conditions, a few very hot and dry days at the end of June promoting the emergence of numerous winged forms, which are the most active in the transmission of virus yellows. This process may be hindered by early sowing and dense stands, particularly in the latter part of June and early July. The microclimate prevailing in such closely spaced crops evidently exerts a restraining influence on the measure of aphid multiplication, and possibly on their activity in general. All the beet varieties grown in Holland are completely susceptible to virus yellows, and at present there is no prospect of any results of practical utility from the work in progress on breeding for resistance.

Hagedorn (D. J.) & Walker (J. C.). **Wisconsin Pea stunt, a newly described disease.**—*J. agric. Res.*, 78, 12, pp. 617–626, 4 figs., 1949.

In 1946 a new virus was isolated from a severely stunted pea plant growing in a nursery at Madison, Wisconsin, and is designated the Wisconsin pea stunt virus. During the last three seasons many pea plants in the State appeared similarly affected, and in 1948 the same virus was isolated from 11 different fields widely distributed over the State.

The characteristic symptoms in the field are severe stunting ($\frac{1}{4}$ to $\frac{1}{2}$ the height of healthy plants) and tight apical rosetting; the leaves are reduced in size and often wrinkled and folded upward, showing marked vein clearing. The middle and lower leaves are slightly chlorotic, sometimes with brown veins. Axillary bud growth is common and often profuse; pod formation is very poor. Inoculated plants in the

greenhouse developed symptoms as in naturally infected plants with wilting, which progressed upwards, death often occurring 20 to 26 days after inoculation. On red clover the virus caused a distinct roughening and wrinkling of the leaves, which were slightly reduced in size, and a very slight mottle. On alsike clover (*Trifolium hybridum*) necrotic chlorosis of the veins developed and slight inward curling of the leaflet margins. White sweet clover (*Melilotus alba*) developed conspicuous, chlorotic, yellow, oblong spots along or between the veins, with definite, irregular margins. Sweet clover (*M. officinalis*) developed characteristic vein clearing.

Low temperature (16° C.) masked the symptoms temporarily. The severity of the apical deformation increased with the rise of temperature. The dilution end-point of the virus is 1:100,000; it resists ageing *in vitro* for 24 but not 48 hours and is thermally inactivated at 56° to 58° C. It was still virulent after 10 days' freezing. The virus was limited in host range to the leguminous plants tested which included sweet pea. All 18 pea varieties studied were susceptible, but none of 11 bean varieties was infected. The pea aphid (*Illinoia* [*Macrosiphum*] *pisi*) transmitted the virus to healthy pea plants in two tests. No seed transmission was evident in 37 plants, the progeny of stunted plants.

Schuster (M. L.). **The etiology and control of root and stem rots of Peas in Washington.**—*Bull. Wash. St. agric. Exp. Sta.* 499, 42 pp., 6 figs., 1948.

Much of the work summarized in this bulletin has already been reported from another source [*R.A.M.*, 25, p. 386]. Apparently pathogenically different strains of *Fusarium solani* f. *pisi* [ibid., 26, p. 1] were found in pea fields in the Palouse and Blue Mountain areas of Washington. *Fusarium oxysporum*, *F. equiseti*, and species of *Phoma* and *Sclerotinia* were less important in causing decay. Pea seed was treated with spergon, semesan, yellow cuprocide, micronized copper, arasan, and thiosan and was stored safely for 30 months, whereas new improved ceresan and micronized sulphur were not safe under all conditions. In tests on the residual effect of seed disinfectants on post-emergence, pathogenic, soil organisms it was found that stem and root rot were less with treated than with untreated seed and that this effect persisted in seedlings sometimes for three weeks or more. Spergon and arasan (1·5 oz. per bush.) were compatible with inoculation of pea seed with nitrogen-fixing bacteria. Higher yields from treated seed were obtained in fields not weeded. Spergon [ibid., 27, pp. 4, 169; 28, p. 152] used at 1·1 oz. per bush. was as effective as 2 oz., and of the various materials studied was the best seed protectant for peas.

Allington (W. B.) & Chamberlain (D. W.). **Trends in the population of pathogenic bacteria within leaf tissues of susceptible and immune plant species.**—*Phytopathology*, 39, 8, pp. 656–660, 1949.

Using a method involving the water-soaking of attached leaves by forceful spraying, inoculation by steeping in or atomization with standard bacterial suspensions, and the daily determination of the bacterial population within the tissues by the ordinary plating-out techniques, already applied to the investigation of soy-bean wildfire [*Pseudomonas tabacum*: *R.A.M.*, 25, p. 200], the authors studied the multiplication of two pathogens in immune and susceptible hosts, viz., *Xanthomonas phaseoli* [cf. ibid., 28, p. 151] and *Pseudomonas glycinea* in bean (*Phaseolus vulgaris*) and soy-bean [ibid., 24, p. 264; 25, p. 544]. Multiplication, presumably in the intercellular spaces, was for the first day about equal in both plants and was not greatly different until the second or third day, while after five or more days the inhibitory effect of the uncongenial host (soy-bean in the case of *X. phaseoli* and bean in that of *P. glycines*) was manifested by the less rapid increase or marked decrease in the bacterial population. Some pathogens, therefore,

can live and multiply in hosts considered immune. In the congenial host, on the other hand, the organisms continued to increase until the tissues were destroyed. Thus, in a test with *P. glycines*, the maximum number of bacteria per 4 mm. leaf disk (15,666,666) in soy-bean was attained 7 days after inoculation, whereas at the end of 17 there were only 155,366 in bean, falling to 114,266 by the 32nd day. In one of the tests with *X. phaseoli* the maximum population of 165,333,333 for 4 mm. leaf disk had developed by the fifth day after inoculation as against 854,166 and 410,333 in soy-bean on the sixth and seventh days, respectively.

Gorenz (A. M.), Larson (R. H.), & Walker (J. C.). **Factors affecting pathogenicity of pink root fungus of Onions.**—*J. agric. Res.*, 78, 1–2, 3 figs., 2 graphs, 1949.

In order to test the reaction of onion seedlings or setts to various isolates of *Pyrenochaeta terrestris* [*R.A.M.*, 28, p. 202] under varying conditions, replicated sand cultures were set up in soil temperature tanks, using Hoagland's nutrient solution 1H [ibid., 25, p. 424]. Inoculum was prepared from disks of Czapek's dextrose malt agar cultures, incubated for ten days at 28° C. in aerated Czapek's modified liquid medium, macerated and mixed with distilled water and sand. After 28 to 30 days' growth the seedlings were graded into five classes; 0, no pink root; 25, slightly affected; 50, moderately affected; 75, severely affected; and 100, dead. A disease index was also calculated.

The results showed that disease indices were higher at 28° than at lower temperatures and that, except in the case of the most resistant variety Excel, the concentration of the inoculum made little difference to the index at 28° whereas at 16°, 20°, and 24° increase in the inoculum raised the index. The disease ratings in soil were lower than those in sand. The isolates La-S and Tex-T were more virulent than the others, but virulence was not of the same order on all varieties. Cultures retained the same degree of virulence for about 18 months. The differences between isolates were more pronounced at 16° and became less evident with increase in temperature. Differences in host resistance were less pronounced when virulent isolates were used. There was no consistent difference in disease indices at different pH levels from 4 to 8, but at the higher level roots were darkest red, while many brownish roots were found at pH 4. The resistance of Excel and the other highly resistant variety used, Yellow Bermuda, was suppressed as the temperature rose to 28°, the latter variety eventually showing an index of 100.

The optimum conditions for severe tests having been established, various onion varieties were then tested for susceptibility to several isolates of the fungus. Yellow Bermuda 1 had the lowest index (58) with Excel 1 second (69·2). Isolate Cal-D-T was the most virulent. In a second series Beltsville Bunching was the most resistant (72·9) followed by Excel 2 (83·5) and California Hybrid Red (84·8), Excel 1 having 86·7; Cal-D-T and La-S-S were the most virulent isolates. In a third series Yellow Bermuda 2 was the most resistant (58), followed by White Sweet Spanish (61·3), isolate Col-FC_2-T being the most virulent, causing maximum disease indices in all varieties.

Chupp (C. H.) & Paddock (W. C.). **Big-vein of Lettuce in New York State.**—*Plant Dis. Reptr*, 33, 7, pp. 280–281, 1949. [Mimeographed.]

In the spring of 1949 an epidemic of lettuce big vein virus [*R.A.M.*, 28, p. 109] occurred on light, sandy soil on Long Island, New York State, where up to the present incidence has been sporadic and of minor importance. At Kingston, Ulster County, 20 per cent. of the plants were affected, and in Nassau County losses ranged from 10 to nearly 100 per cent. Apparently a mild winter followed by periods of unusually high temperatures and rainfall in March and April were responsible for

the outbreak. Judging by the appearance of the diseased plants, there were at least three infection periods; one in March or earlier, another a few weeks later, and one in which the leaf symptoms were just beginning to show. Big Boston and Iceberg varieties had pale yellowish-green leaf veins, those on Cos were almost white. There was some evidence indicating that an early and severe infection may kill the plant.

On one farm, direct sowing of Big Boston in February resulted in nearly total loss, while plants transplanted from cold frames developed almost normally [cf. ibid., 25, p. 487]. A marked drop in symptom expression was observed at soil temperatures below 57° F. All three varieties were equally susceptible, but the commercial value was lowered most in Big Boston, somewhat less in Iceberg, and least in the Cos or Romaine type.

Pound (G. S.). **A virus disease of Watermelon in Wisconsin incited by the Tobacco ringspot virus.**—*J. agric. Res.*, 78, 12, pp. 647–658, 6 figs., 1949.

In August, 1946, watermelon and muskmelon plants in a field at Merrimac, Wisconsin, exhibited typical virus symptoms, and a virus was isolated from the former. In 1947 the same virus was recovered from the two hosts in the same area, but the incidence was lower. In 1948 the disease reappeared on a much larger scale, affecting about 10 per cent. of the watermelon plants and causing considerable losses.

Naturally infected muskmelon plants showed marked stunting and a yellow-green mottle accompanied by leaf malformation. Fruit set and size were considerably reduced. After several weeks the symptoms became masked. Watermelon plants were severely stunted and chlorotic. Fruits which set were warty and sometimes exuded small drops of a viscous liquid at necrotic spots on the surface. They were unmarketable. The most characteristic symptom, however, was the upright habit of the distal ends of the runners. The leaves showed a coarse mottle accompanied by irregular, black, necrotic lesions. Internodes were markedly shortened, producing a compact, bunchy growth. Both leaves and stems were extremely brittle. Infected plants tended to recover toward the end of the season, but the symptoms were much more persistent than in muskmelon.

All bean [*Phaseolus vulgaris*] varieties tested in the greenhouse were susceptible to the virus, the reaction being almost wholly necrotic. All inoculated pea varieties showed identical reactions, which included severe stunting, yellow mottling, and necrotic streaking of the main stem, followed by death. At 24° and 28° C. tobacco and cucumber plants showed a marked tendency toward recovery, while at low temperatures symptoms were persistent.

The properties of the isolated virus and extensive cross-protection tests with tobacco plants revealed that the watermelon virus is a strain of tobacco ring spot virus [cf. *R.A.M.*, 25, p. 484], against which it afforded complete protection.

Chiu (W. F.) & Walker (J. C.). **Physiology and pathogenicity of the Cucurbit black-rot fungus.**—*J. agric. Res.*, 78, 12, pp. 589–615, 4 figs., 5 graphs, 1949.

Further studies on *Mycosphaerella melonis*, the agent of black rot of cucurbits [*R.A.M.*, 28, p. 614], showed that small amounts of orange extract or cucurbit cotyledon extract added to the medium stimulated germination of both ascospores and pycnidiospores (85 to 100, and close to 100 per cent., respectively, after 12 hours at 24° C.). In the presence of plant extracts the optimum temperature for pycnidiospore germination was between 24° and 28°, in sterile tap water (germination 0 to 65 per cent.) ,between 20° and 24°. Dextrose slightly stimulated pycnidiospore

germination, while sucrose inhibited it; both effects were additive. A nutrient solution containing all essential minerals and assimilative carbon inhibited germination somewhat in the presence of orange extract.

In toxicity tests in Petri dishes silver nitrate was the most toxic of all substances investigated; 0·01γ of silver per mm. inhibited 95 per cent. of germination, whereas 4·3 to 19 γ of copper was required. Mercuric chloride was also highly toxic, but zinc sulphate was inferior to copper sulphate.

On potato dextrose agar optimal fungus growth occurred at 20° to 24°, the maximum at 36°, and the minimum at somewhat below 12°. The initial pH value of the medium had no effect on growth, except at values below pH 4. Sporulation of the fertile As strain [loc. cit.] was most abundant at pH 7.

Experiments at Madison, Wisconsin, showed that the fungus overwintered as dormant mycelium in infected watermelon and squash debris, and a new crop of pycnidia was produced in the spring in one test.

The reductions in emergence of sterilized seed of Hubbard squash (*Cucurbita maxima*), Table Queen squash (*Cucurbita pepo*), and Hawkesbury and Improved Kleckley Sweet watermelon sown in inoculated soil in the greenhouse were 26, 18, 15, and 6 per cent., respectively. No symptoms appeared on the primary leaves of the seedlings, but spotting of the cotyledons was common. On watermelon small, green spots developed on the lower surface, later turning grey green and becoming round or irregular in shape. At high temperature and humidity the spots extended sometimes over the whole cotyledon. On Hubbard squash, raised, reddish-brown to orange pustules up to 2 mm. in diameter, surrounded by a yellow halo, appeared on the lower surface as soon as the cotyledons emerged. The whole cotyledon turned yellow and sometimes shrivelled. About 16 per cent. of the Table Queen squash seedlings developed hypocotyl cankers, which started with an indefinite brownish lesion increasing under favourable conditions and girdling the plant. Sometimes the tissue of the girdling lesion dried out, and the top of the plant remained turgid.

The results of tests in which squash and watermelon seedlings were inoculated with pycnidiospore suspensions of *M. melonis* indicated that watermelon was much more susceptible than squash, the cotyledons and leaves of the former often showing generalized blight. Both ascospores and pycnidiospores produced equally heavy infection on cotyledons and leaves of watermelons. In Improved Kleckley Sweet there was a rapid increase in leaf resistance with age, and a similar, but much slower, progression occurred in Hawkesbury. Cucumber seedlings were highly resistant. When cucurbit cotyledons were wounded prior to inoculation the rate of infection was considerably higher than that in unwounded ones.

The most favourable temperature for infection of watermelon was found to be 24°, but the disease progresses subsequently about equally well on young plants from 20° to 28°. The optimum temperature for infection of muskmelon was 18°.

In the case of watermelon, pycnidiospores sprayed on to cotyledons penetrated both surfaces directly. On cucumber cotyledons, no penetration occurred on the upper, and only occasionally on the lower. The rate of infection increased, when the upper surface was abraded with carborundum. The mycelium penetrated directly the hypocotyls and stems of Table Queen squash, watermelon, and muskmelon seedlings only if it was placed in close contact with these parts and supplied with sufficient moisture. In the field it was observed that the long contact of watermelon, muskmelon, and cucumber vines with damp infested soil usually induced development of vine cankers, which started on the lower side of the stem.

Ten strains of the fungus, secured by single-spore isolations, when tested on hypocotyls of Table Queen squash showed a gradation from very high pathogenicity (mutants *B-1a*, *B-1b*, and *A-2* killing 67, 62·6, and 66·6 per cent. of the plants, respectively) to none.

Field experiments demonstrated that Improved Kleckley Sweet watermelon was definitely more resistant than Hawkesbury, which developed severe cankers in the cotyledonary node region with yellowing and gradual defoliation of the older portion of the vines. Wisconsin Pride muskmelon was as susceptible as Hawkesbury. Cubit cucumber was highly resistant, while Stays Green, Parker, and National Pickling were very susceptible.

Macfarlane ([Miss] C. S.). **'Vlamsiekte' or 'bacterial blight' of Vines.**—*Fmg S. Afr.*, 24, 282, pp. 399–402, 9 figs., 1949.

The bacterial blight (*Erwinia vitivora*) [*R.A.M.*, 27, p. 173] of grape vines has spread to the Paarl Valley in South Africa. Somerset West and Constantia are most seriously affected. Much of the information on symptoms and control has already been noted in this *Review*.

Catoni (G.) & Refatti (E.). **Dati sul controllo dell' 'arricciamento' nelle piante madri di Viti in Provincia di Trento.** [Data on the control of 'leaf roll' in mother-plants of Vines in the Province of Trento.]—*Notiz. Malatt. Piante*, [*1949*], 3, pp. 36–38, 1949. [Mimeographed.]

In 1925, when vine leaf roll or 'arricciamento' [? vine mosaic virus: *R.A.M.*, 9, p. 83; 25, p. 493] was spreading markedly in the province of Trento, Italy, spread coinciding with the reconstitution of the vineyards, a control service was instituted, which has functioned uninterruptedly to the present year. The records kept from 1925 to 1943 were destroyed during the war. Every grower in the province is legally obliged to send, every spring, to the local Phytopathological Delegation a specimen collection of about 25 branches from each race of American vine or hybrid used as stock whether grown by himself or otherwise acquired, the origin of the material being stated if the vine is not home-grown. Co-operation by the growers has been excellent. Microscopic examination is then made by experts for the presence of endocellular cordons. If the result is doubtful or if cordons are present in under 10 per cent. of the branches the vineyard is examined. When the percentage is over 10 all affected vines are destroyed. From 1944 to 1948, inclusive, the numbers of affected specimens found were 20, 11, 0, 16, and 3, the corresponding percentages of infection being 7·2, 14·3, 0, 15·2, and 4·6.

The results show that in the area concerned Rupestris is the most susceptible variety, followed by the hybrids derived from it, the susceptibility of which depends on their Rupestris content. *Vitis riparia* appears to be among the most resistant varieties, the hybrids from it being relatively resistant, particularly *V. riparia* × *V. berlandieri*. As a result of this work the infection centres have been virtually eliminated in a few years.

Roseau (H.). **Observations sur l'oïdium.** [Observations on *Oidium*.]—*Vitic. Arboric., Paris*, 95, 7, pp. 204–206, 1949.

During the war period, owing to the inadequacy of sulphur supplies, the most difficult fungal disease of vine to control in the Cherchell coastal region [Algeria] was *Oidium* [*Uncinula necator*: *R.A.M.*, 19, p. 325; 27, p. 507; 28, p. 376], though before 1939 the disease had easily been kept down.

The local vineyards mainly consist of the Carignan variety, which is susceptible to *U. necator* directly growth starts. The other varieties grown, Cinsault, Grenache, and Alicante-Bouschet, are attacked only as flowering-time approaches, and Cinsault, particularly, is then even more susceptible than Carignan, the other varieties less so. Once the disease has attacked the berries on Cinsault it causes severe damage, 80 per cent. or more of the crop being destroyed, and cannot easily be kept down by dusting with either ordinary or sublimated sulphur, as it can be on

Carignan. A Carignan vineyard with severely infected fruit can yet give a normal crop if sulphur treatment is adopted.

An application at 20 kg. per ha. of sublimated sulphur to Carignan vines a few days after bud opening, when the shoots are 10 cm. long, a second ten days later at 30 kg. per ha., and a third (50 kg.) at flowering, and a dusting of the fruit clusters with a mixture of sublimated sulphur (30 kg.), black sulphur (30 kg.), and lime (40 kg.) per ha. gave good results in three successive seasons. In years when mists are frequent one or two further treatments should be given with wettable sulphur (20 kg. per ha.) incorporated with the copper spray used in the first few treatments against mildew [*Plasmopara viticola*]. With Cinsault, Grenache, and Alicante-Bouschet three dustings should be given, two with sublimated sulphur, at the end of April (40 kg.) and at flowering (50 kg.), and the same mixture on the fruits as was used on Carignan. With Carignan, the critical period for treatment is between bud-burst and flowering; with Cinsault, it starts a few days before flowering and lasts until the berries ripen.

Limasset (P.). **Travaux sur les maladies à virus des végétaux.** [Investigations on virus diseases of plants.]—*Bull. tech. Inform. Ingén. Serv. agric.*, [*1949*], 41, pp. 413–418, 1949.

After briefly referring to the history of plant virus disease investigations, the author draws attention to the ease and rapidity with which under modern conditions these diseases can be spread. In 1948 the production of virus-free [seed] potatoes reached 613,500 tons in France. The difficulties of securing the collaboration of growers in the task of controlling plant virus diseases are discussed, and the author then reviews the work done since 1918 by the Station Centrale de Pathologie Végétale [*R.A.M.*, 29, p. 10]. The work now in progress falls into two parts, the improvement of selection methods as applied to potatoes and other crops and the investigation of long-term problems, especially immunity. The serological method [ibid., 27, p. 149; 28, p. 412] is being applied to the detection of beet virus yellows and studies are in progress on the control of this disease.

Köhler (E.). **Über einige Probleme der allgemeinen Viruspathologie der Pflanzen.** [On some problems of the general virus pathology of plants.]—*Mitt. biol. Anst.* (*Reichsanst.*), *Berl.*, *1943*, 67, pp. 31–46, 5 figs., 1943. [Received October, 1949.]

This is a critical review and discussion of 30 contributions to the literature on two problems of general virus pathology, namely, the spontaneous origin of viruses, and protective inoculation (the immunization of a plant by a virus already present against superinoculation with another).

Pfankuch (E.). **Die Bedeutung unserer Kenntnisse von Aufbau und Eigenschaften der Virusproteine für eine Chemotherapie der Viruskrankheiten.** [The importance of our knowledge of the structure and properties of virus proteins for a chemotherapy of the virus diseases.]—*Mitt. biol. Anst.* (*Reichsanst.*), *Berl.*, *1943*, 67, pp. 46–57, 5 figs., 1 graph, 1943. [Received October, 1949.]

In the course of this lecture on the structure and properties of virus proteins in relation to the chemotherapy of virus diseases, some figures are cited to illustrate the degree of inactivation of the tobacco mosaic virus by various substances. The numbers of local lesions (in percentages of those on the infected, untreated controls) on half leaves of *Datura stramonium* treated with Victoria blue [*R.A.M.*, 18, p. 556] 1 in 10,000 and 1 in 100,000 were 4 and 100, respectively; with Browning No. 47 (a highly bactericidal dye) at the same dilutions 35 and 100; and with tannin (same concentrations) 24 and 100. Total inactivation was effected by treatment

of the same material with horse serum globulin (in M/10 phosphate) at 1 in 1,000, while the same substance in 1·5 per cent. sodium chloride reduced the incidence of infection from 100 to 14 per cent. The following were the percentages of infection obtained after inactivation of the virus by treatment with electro-neutral, surface-active compounds: saponin III 1 in 5,000, 50; saponin II 1 in 50,000, 54; dodecyl-glucoside 1 in 100,000, 60; and dodecyl-piperidinium-acetic acid 1 in 100,000, 69. At 1 in 10,000 the invert soaps octyl-, decyl-, dodecyl-, and tetradecyl-dimethyl-benzyl-ammonium chloride permitted, respectively, 100, 55, 4, and 2 per cent. tobacco mosaic virus infection on *D. stramonium* half leaves, the corresponding figures for hexadecyl- and octadecyl-dimethylbenzyl-ammonium chloride being 50 and 54, respectively. When inoculation followed immediately after treatment with the capillary-active anion, decylsulphate, at 1 in 1,000 and 1 in 10,000, the numbers of lesions developing on the half leaves were 11 and 97 per cent., respectively, of those on the untreated controls, the corresponding figures for material inoculated 24 hours later being 6 and 45, respectively. For bornylphosphoric acid at 1 in 1,000 and 1 in 10,000 the percentages of infection were 66 and 99, respectively, when inoculated immediately after treatment and 59 and 88, respectively, 24 hours later. A non-capillary-active polypeptide-like compound, germanin, inactivated the tobacco mosaic virus as follows: at 1 in 100 the percentage of lesions, in comparison with the untreated, infected control half leaves of *D. stramonium*, was 34; at 1 in 1,000, 53; at 1 in 10,000, 61; at 1 in 100,000, 82; and at 1 in 1,000,000, 100.

Bennett (C. W.). **Recovery of plants from Dodder latent mosaic.**—*Phytopathology*, 39, 8, pp. 637–646, 1 fig., 1949.

In further studies at the U.S. Sugar Plant Field Laboratory, Riverside, California, on the recovery of plants from dodder latent mosaic virus [*R.A.M.*, 23, p. 24], sugar beet, Golden Self Blanching celery, *Phytolacca americana* [*P. decandra*], Riverside tomato, and potato showed marked symptoms of disease after inoculation with the virus, but made a quasi-complete or complete recovery with continued growth. No recognizable symptoms were shown by the following hosts of dodder latent mosaic virus: *Nicotiana glauca*, *N. rustica*, Turkish tobacco, *Brassica adpressa*, *Cuscuta californica*, and *C. campestris*.

Recovery was accompanied by marked reduction in virus concentration in the corresponding portions of the plant. In symptomless carriers infected for more than three weeks virus concentrations were very low in comparison with those in recently inoculated *P. decandra* plants. Thus, the average number of lesions per half leaf of *P. decandra* inoculated with juice from the above-mentioned symptomless carriers infected more than three weeks earlier ranged from 0 to 1·5, as against 11 to 63·5 using material from recently inoculated foliage of the same host. In the case of *C. campestris* the virus concentration reached a relatively high level a few days after inoculation and then receded to a comparatively low one.

When recovered tomato plants were inoculated with tobacco etch or tobacco mosaic viruses, dodder latent mosaic symptoms reappeared and persisted on the young foliage and the plants remained stunted, regardless of the sequence of virus introduction. The concentration of the dodder latent mosaic virus in the dwarfed plants seemed to be established and maintained at much higher levels than those in recovered plants infected by that virus alone. Thus, the average number of lesions produced on half leaves of *P. decandra* inoculated with juice from tomato plants infected by dodder latent mosaic virus alone ranged from 0·3 to 6·6, as compared with 21·4 to 41·3 for the same virus plus tobacco etch and 14·8 to 28·5 for the dodder latent mosaic and tobacco mosaic virus combination. On the other hand, the presence of dodder latent mosaic virus appeared to exert no influence on either of the tobacco virus concentrations.

The critical factor in recovery of plants from dodder latent mosaic seems to be restriction of the virus to concentration levels too low to induce marked symptoms of disease.

WATSON (MARION A.). **Some notes on plant virus diseases in South Australia.**—*J. Aust. Inst. agric. Sci.*, 15, 2, pp. 76–81, 4 figs., 1949.

During a visit to the Waite Agricultural Research Institute, Adelaide, the author showed in October, 1947, that dying plants of *Trifolium subterraneum* and others with a bright yellow and green mottle were infected with subterranean clover virus [*R.A.M.*, 22, p. 485]. Inoculations by rubbing were made from two affected varieties (Bacchus Marsh and Mount Barker) of *T. subterraneum* to the same host, to *T. incarnatum*, Greenfeast peas, and Hawkesbury Wonder French beans (*Phaseolus vulgaris*). Typical symptoms [loc. cit.] developed on *T. subterraneum* and on *T. incarnatum*. On peas there was very slight vein-clearing, followed by systemic mottle of small, dark green vein bands on a paler background. Affected leaves became yellowish with old age, but the symptoms disappeared after two or three weeks. On French bean the symptoms were a fine interveinal mottle of dark green on a paler background, with some stunting, and a slight prolongation of the leaf tips. The virus was transmissible by *Myzus persicae* and *Macrosiphum euphorbiae*.

A virus disease believed to be a yellow mosaic strain of common pea mosaic was found in peas near Adelaide. It was transmitted by sap inoculation and by *Myzus persicae* to Greenfeast peas and subterranean and crimson clovers. In Greenfeast peas there was distinct clearing of the veins of the youngest leaves, followed by a brilliant yellow mottle with dark green streaks bordering the yellow areas. Necrotic flecks or streaks were present, and the under surface of the leaves was rough. In crimson and subterranean clovers the symptoms were milder than those caused by the subterranean clover virus and the plants were less susceptible.

A virus, probably a strain of cucumber mosaic virus, was obtained from stunted *Nemesia* plants which showed distorted young leaves with necrotic flecks, stems, and growing points. It was inoculated by rubbing on to leaves of tobacco, tomato, *Nicotiana glutinosa*, and *Petunia hybrida*. On the last two the symptoms were fairly typical. On tomato plants typical fern-leaf symptoms developed. The younger tobacco leaves had deformed margins about six weeks after inoculation. The virus was transmitted by *M. persicae*.

A virus isolated from bushy, stunted *P. hybrida* plants showing mottling, distortion, and some necrosis of the young leaves was provisionally identified as a strain of the tobacco ring spot virus.

VAN DE POL (P. H.) & FLIPSE (L. P.). **Overzicht van de belangrijkste ziekten en plagen in de tuinbouw in 1948.** [Survey of the most important diseases and pests in horticulture in 1948.]—*Maandbl. LandbouwVoorlicht.*, 6, 3–4, pp. 107–117, 7 figs., 1949.

In contrast to 1947, the humid conditions prevailing in Holland during 1948 favoured the development of fungal diseases in horticultural crops. Neck rot of onions and shallots (*Botrytis allii*) [*R.A.M.*, 19, p. 188] was much in evidence in consignments intended for export, especially from Tholen and the reclaimed areas. Direct control measures are not known, but the bulbs should be allowed to ripen fully and then be quickly dried, while nitrogenous fertilizers should be sparingly applied.

After some preliminary trials the apple and pear scab (*Venturia* spp.) [*V. inaequalis* and *V. pirina*] spray warning service [ibid., 28, p. 220] was put into

operation in 1948. The first ascospores were observed in the open as early as 16th March, and the rainy spell at the end of April and beginning of May promoted active dissemination at the close of the blossoming period.

The so-called 'New York canker' of apples (*Physalospora* [*sphaeropsis*] *malorum* Peck) [*P. obtusa*: ibid., 16, p. 543 *et passim*] was observed here and there. Soil factors are believed to play an important part in its development.

During rainy periods in the autumn quince and pear seedlings were extensively attacked by *Mycosphaerella sentina* [ibid., 28, p. 64 *et passim*] and *Fabraea maculata* [ibid., 27, p. 429] in orchards where copper spraying had been neglected. Premature defoliation resulted in some places, especially in Limburg and Groningen.

Red and black currants also sustained heavy damage from leaf fall (*Pseudopeziza ribis*) [ibid., 12, p. 705]. *Pseudomonas* [*Xanthomonas*] *hyacinthi* [ibid., 12, p. 514] was widespread in hyacinth fields in the bulb-growing area, causing up to 20 per cent. infection in some and as much as 50 per cent. in a few cases. The spread of the disease may be prevented by late lifting and transference of the bulbs to a cool place with plenty of ventilation.

The 'Augusta' disease of tulips of unknown etiology, assumed a serious character in 1948. The first symptom is the appearance of foliar stripes, which soon turn into necrotic lesions. Growth is much impeded, and finally the plants may wither away. *Sclerotium tuliparum* [ibid., 27, p. 134] occurred in various localities. Narcissus root rot (*Cylindrocarpon radicicola*) [ibid., 11, p. 243] is a troublesome problem in the bulb-growing zone; in the Haarlem district, for instance, extensive areas are no longer cultivable on account of the disease. Favoured by the preceding hot summer, *Fusarium bulbigenum* was still present in the *Narcissus* fields in 1948.

Botrytis gladiolorum [ibid., 25, p. 501 *et passim*] is still one of the limiting factors in *Gladiolus* culture, and weather conditions after lifting were conducive to its development.

Report of the Associate Committee on Plant Diseases of the National Research Council and the Dominion Department of Agriculture.—*Nat. Res. Coun. Rev. 1949*, pp. 211–216, 1949.

In this report of work carried out in Canada during 1948 and the beginning of 1949, research at the University of Alberta under the direction of A. W. Henry is described showing that between 83 and 98 per cent. of the sclerotia of the ergot fungus [*Claviceps purpurea*: *R.A.M.*, 27, p. 314] collected from rye in 1947 germinated in the field in June, 1948. The sclerotia can germinate at a depth of 24 in. but are effective only if less than ½ in. deep. Germination in soil at 10°, 20°, and 30° C. was 16 per cent., 46 per cent., and none, respectively.

Research at the University of Saskatchewan directed by T. C. Vanterpool has shown that there are at least five distinct types of *Rhizoctonia* [*Corticium*] *solani* attacking flax seedlings [ibid., 27, p. 554; 28, p. 215]. This fungus constituted 25 per cent. of the fungi associated with root rot of flax in three fields observed, but was not isolated from flax seeds in plants left in swathes or windrows for several weeks under dry conditions. Flax sown every two weeks in soil inoculated at the beginning with *Corticium solani* developed the following percentages of damping-off after setting out: 21, 3, 5, 0, 0, 0.

Under the direction of R. A. Ludwig at McGill University it was shown that disease development in barley caused by *Helminthosporium sativum* [ibid., 28, pp. 440, 520] is dependent on the presence of a toxic substance (or substances) produced by the fungus. The toxin is produced only on certain types of culture medium especially in the presence of plant decoctions and peptone. Treatment of planting soil with 2,4-D stimulated disease production by viable but non-potent inoculum [cf. ibid., 28, p. 278].

Hilton (S. A.). **Progress Report, 1937–1947. Dominion Experimental Station, Fredericton, New Brunswick.**—101 pp., 22 figs., 2 diags., 6 graphs, 1947. [Received December, 1949.]

J. M. F. MacKenzie reports that from 1937 to 1947 over 60 varieties and strains of wheat were tested locally for disease resistance and yielding ability [*R.A.M.*, 28, p. 622]. During the last seven years Cascade [ibid., 27, p. 11] has been the highest yielder of the soft wheats, has shown good resistance to leaf [brown] and stem rust [*Puccinia triticina* and *P. graminis*, respectively], and has been free from mildew [*Erysiphe graminis*].

The susceptibility of Ajax oats [ibid., 28, p. 562] to stem rust is increasing, which suggests that race 8 is becoming more prevalent locally. However, Ajax has never developed crown rust [*P. coronata*] severely at the Station. Erban [ibid., 26, p. 385] has shown high resistance to crown rust during the 12 years it has been tested, and produces a fair yield when the disease is severe. Beaver, over six years, has shown the same high resistance as Erban and also good resistance to stem rust. Abegweit, of the same parentage as Beaver (Vanguard × Erban), carries the same amount of resistance to both rusts. Exeter [ibid., 28, p. 624] has given a higher average yield than any other oat variety during the eight-year test period and has shown fair resistance to both rusts. None of the 60 or more barley varieties and strains grown in replicated tests during the past 12 years has been damaged seriously by either stem or brown rust [*P. hordei*] during recent years.

The results of co-operative tests with the Laboratory of Plant Pathology conducted in the Lower Saint John River Valley indicate that the swede club root organism [*Plasmodiophora brassicae*: ibid., 24, p. 43] is particularly virulent in that area. When the disease was severe, none of the varieties or strains listed (Acadia, Ditmaus, Laurentian, and Wilhelmsburger [ibid., 20, p. 616]) produced a profitable crop. When there is only slight infestation Wilhelmsburger may either prove resistant or the injury may be slight and confined to the small roots. In the latter case the roots are usually of good quality when trimmed. Some varieties have shown considerable resistance to brown heart [boron deficiency: ibid., 29, p. 55], but none can be recommended as sufficiently resistant to grow where the disease is likely to be severe. Danish Giant, the most resistant to brown heart and club root of the varieties tested, is not recommended because of its poor type and quality. Application of manure has never given satisfactory control of brown heart at this Station, although swedes grown on manured land had less brown heart than those grown on land treated with a commercial fertilizer. When stecklings were grown on land treated with 30 lb. borax per acre, they did not require additional borax the year they produced seed.

During early August, 1939, L. C. Young and R. G. White investigated a severe outbreak of brown heart among early turnips three to four inches in diameter which had been treated with a borated fertilizer. Late turnips on the same farm were treated with dry borax scattered along the rows at 15, 20, and 30 lb. per acre, or solution poured along the rows at 20 and 40 lb. per acre. All treatments were remarkably effective, giving 100 per cent. control, except for one turnip diseased following the 15 lb. dry application. The adjoining untreated plots had 75 to 100 per cent. brown heart. A plot receiving a 20 lb. borax spray per acre showed 16 per cent. brown heart, a 40 lb. spray gave complete control, while the untreated had 76 per cent. brown heart. Control by spraying was both effective and economical. Extensive trials, carried out from 1940 to 1945, inclusive, indicated that dry, wet, and spray applications will control brown heart satisfactorily provided the roots have not swelled to any extent. Borax applied later than 60 days after planting will probably prove ineffective.

In some years mangolds are severely attacked by a *Cercospora* [*C.* ? *beticola*]

which kills the outer leaves. Tip Top is highly resistant to this disease, Frontenac and Giant White Sugar slightly so.

The second lucerne crop in 1946 developed considerable leaf spot [*Pseudopeziza medicaginis*: ibid., 22, p. 74; 27, p. 96]. Ladak and Rhizoma were the most resistant varieties.

L. C. Young and H. T. Davies, in charge of potato-breeding investigations, state that since 1937 leaf roll [ibid., 26, pp. 8, 209; 28, p. 439] has assumed epidemic proportions in Eastern Canada, changing it from a relatively unimportant disease in 1933 to the most important and most serious virus disease in recent years. An isolation station, for the propagation of virus-free stocks, has been set up at Alma, Albert County, in an area widely separated from other potato fields and in a coastal region where aphids are usually scarce. Several seedlings developed at the Station appear to be considerably resistant to leaf roll. One in particular gave a satisfactory performance across Canada in 1947.

During 1947 204 seedlings resistant to blight [*Phytophthora infestans*: ibid., 28, p. 540] were grown and 93 selected for further observation, together with 65 resistant to scab [*Actinomyces scabies*: ibid., 26, p. 414; 28, p. 441], and 98 resistant to mild mosaic [? potato virus A]. An additional 667 seedlings were produced to combine resistance to both scab and late blight. In the blight programme more than 83,000 seedlings have been produced to date, using the wild species *Solanum demissum*. A considerable number of these appear satisfactory in appearance, yield, and quality, and are highly resistant to blight, having remained free from the disease even when unsprayed. Although some difficulty is being experienced in combining earliness with scab resistance, several of 65 apparently promising seedlings are no later in season than Green Mountain.

Plant diseases.—*Agric. Gaz. N.S.W.*, 60, 10, pp. 527–530, 6 figs., 1949.

The symptoms and spread of and control measures for black spot [anthracnose (*Elsinoe ampelina*): *R.A.M.*, 22, p. 469] and downy mildew [*Plasmopara viticola*: ibid., 28, p. 210] of vine in New South Wales are described. Winter treatments for the former, which develops earlier and at lower temperatures, include burning prunings and loose bark which has been removed. Downy mildew attacks chiefly when the fruit is set and sometimes as many as six sprayings are made. The symptoms, causes, and control measures for blossom-end rot of tomatoes [ibid., 24, p. 252] are also discussed.

Hopkins (J. C. F.). **Summary of Annual Report of the Chief Botanist and Plant Pathologist for the year ended 31st December, 1948.**—*Rhod. agric. J.*, 46, 4, pp. 278–285, 1949.

In this report on plant disease work carried out in Southern Rhodesia during 1948 [cf. *R.A.M.*, 28, p. 209] it is stated that during October and November symptoms suggestive of virus infection appeared in tobacco seed-beds. On investigation, however, the condition was found to be due to indiscriminate application of benzene hexachloride by growers and to the vapour of 2,4-D proprietary weed-killer [cf. ibid., 26, p. 460] stored in tins near potted plants. Although severely stunted, the affected plants recovered and made normal growth when no further applications were given.

The occurrence of fig mosaic, the symptoms of which correspond exactly to those produced by fig virus 1 [fig mosaic virus: ibid., 27, p. 528], appears to be the first record of this disease in Africa.

Bacterial wilt of sunflower, groundnut, and black jack [*Bidens pilosa*] appeared in an experimental area where the host range of *Pseudomonas* [*Xanthomonas*] *solanacearum*, was being investigated. Tobacco growing close to infected plants

remained healthy. This confirms the findings of last season that the strain of *Xanthomonas solanacearum* [ibid., 27, pp. 96, 117] affecting tobacco is distinct from that causing wilt of other plants.

The *Ascochyta* leaf spot of tobacco [*A. nicotianae*], undoubtedly new to this crop in Southern Rhodesia, appeared in a limited area in the Karoe district. There were indications that field spraying with Bordeaux mixture controlled the disease effectively, but a more detailed study will be made in the 1948–9 season. Frog eye (*Cercospora nicotianae*) [ibid., 28, p. 312], both field and barn spot, was present in all bales inspected. *Alternaria* leaf spot (*A. longipes*) and barn rot (*Rhizopus arrhizus*) [ibid., 27, p. 118] were common.

Peach mildew [*Sphaerotheca pannosa* var. *persicae*: ibid., 25, p. 265] is now widespread and has damaged susceptible varieties in Inyanga orchards this season. It is suggested that spraying should be adopted as a routine practice until resistant varieties suited to all conditions have been propagated.

Black rot [*X. campestris*] is still widespread in cabbages and other crucifers, especially during wet weather. The disease is a menace to the production of these crops and its prevalence can be attributed to contaminated seed. Imported seed of *Brassica* spp. showed contamination by black rot ranging from 5 per cent. in South African seed to over 50 per cent. in some American samples.

Experiments demonstrated that *Septomyxa affinis* is the cause of leaf blotch or scab of young seedling tobacco leaves and is identical with the disease recorded in America [ibid., 8, p. 342].

Annual Report on the Agricultural Department, Nigeria, 1947.—83 pp., 1949.

On p. 55 of this report [cf. *R.A.M.*, 28, p. 271] K. T. Hartley reports that nearly all the outbreaks of swollen shoot disease of cacao [loc. cit.] are confined to the Ibadan area. Small differences were noticed, especially in the expression of leaf symptoms, which suggest the occurrence of different strains of the virus, but six isolations all produced swellings on the stems and twigs. A virus of a different nature, which does not induce swellings, was found on cacao trees at Asalu in Abeokuta Province. It produces small, irregular, pale markings on the leaf along the primary and secondary veins on both sides. The leaf tends to be narrowed, with secondary veins at an acute angle to the midrib, and sometimes curved. The leaf symptoms have been transmitted repeatedly by grafting. The disease does not appear to be very destructive.

An experiment was carried out at Ibadan to determine whether a plot of cassava plants, susceptible to mosaic [loc. cit.], could be maintained free from the disease in order to provide healthy planting material. Cuttings taken from apparently healthy Karagba plants were grown in a plot at a distance from other cassava. Of 1,620 cuttings, 1,312 infected ones were destroyed in the first two weekly inspections six weeks after planting and replaced by cuttings from neighbouring symptomless plants. Thereafter the number of infected plants decreased sharply and from five to eleven months no diseased plants were found. At Umuahia a similar test on a collection of local and promising varieties proved more difficult, since 90 per cent. of the cuttings were found to be infected on sprouting.

Seed treatment with copper carbonate continues to be the only effective method for controlling smut [*Sphacelotheca* spp.] of guinea corn [sorghum: loc. cit.].

[Deighton (F. C.).] **Plant pathology.**—*Rep. Dep. Agric. S. Leone, 1948*, p. 25, 1949.

This report [cf. *R.A.M.*, 25, p. 253; 28, p. 620] includes the following among the new records for Sierra Leone: *Cercospora longissima* [ibid., 23, p. 428] on leaves of old lettuce plants, *Cystopus candidus* [ibid., 27, p. 542] on radish, *Helminthosporium leucostylum* [ibid., 15, p. 426] on *Eleusine indica*, and *H. sacchari* on *Cynodon dactylon*.

Wallace (G. B.). **Annual Report of Plant Pathologist, 1946.**—*Rep. Dep. Agric. Tanganyika, 1947*, pp. 144–145, 1949.

In this report [cf. *R.A.M.*, 27, p. 353] the following are listed among the new records for Tanganyika Territory in 1946, apart from those already noticed [ibid., 28, p. 472]: *Macrophomina phaseoli*, causing pod spot of Lima bean [*Phaseolus lunatus*] and present on potato haulms, *Phyllosticta orbicularis* causing pumpkin leaf spot, *Colletotrichum capsici* [ibid., 27, p. 464] on rhubarb petioles, *Cercospora ipomoeae*, causing leaf spot of sweet potato [cf. ibid., 27, p. 353], Para rubber mildew (*Oidium heveae*) [cf. ibid., 27, p. 158], and *Eucalyptus* leaf spot (*Sphaerella molleriana*).

Papaws were affected by root disease (*Armillaria mellea*) [ibid., 27, p. 483] not previously recorded on this host. Its occurrence on Kilimanjaro, where the soil is neutral and the disease rare, indicates that papaw is very susceptible. Rhizomorphs were traced back from one papaw tree to dead *Grevillea* roots, while in a garden the disease spread from a dead *Eucalyptus* root to papaw. It is important to distinguish this disease from *Pythium* root rot [*P. aphanidermatum* and other *P.* spp: loc. cit.], as the control measures are quite different. Several cases of papaw dieback were examined. The first symptoms are the progressively smaller size of the new leaves and premature leaf fall. Finally, no leaves remain and the tree dies. The immediate cause is an inadequate flow of water to the crowns due to root disease (*Pythium* spp. or, in one field, *A. mellea*), drought, or contortion of the roots when originally planted out; the condition is also associated with old age.

In the Bukoba District banana fruits were severely affected by anthracnose [*Gloeosporium musarum*: ibid., 21, p. 184]; the fields were reported to be weedy and the trees uncared for.

Cassava brown streak virus [ibid., 28, p. 271] was present in a few areas of the Eastern Province and killed many plants.

Vanderwalle (R.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1946.** [Observations and researches carried out at the State Phytopathological Station during the year 1946.]—*Bull. Inst. agron. Gembloux*, 16, 1–4, pp. 108–116, 1947. [Received July, 1949.]

In this report on plant diseases in Belgium in 1946 [cf. *R.A.M.*, 28, p. 51] it is stated that *Phyllosticta napi* [loc. cit.] appeared early on turnips but later spread was very slow. No important damage was caused by *Sclerotinia ciborioides* [*S. trifoliorum*], common on imported clovers. *Gladiolus* corms were frequently infected by *Bacterium marginatum* [ibid., 28, p. 455]. Infection of asters by *Fusarium* [*conglutinans* var.] *callistephi* [ibid., 27, pp. 23, 567] made disquieting progress. One case of blossom rot of lilac was caused by *S. sclerotiorum*. *Cattleya* sp. was affected by *Gloeosporium affine* [cf. ibid., 13, p. 184; 25, p. 343], and *Dracaena* sp. by *Physalospora dracaenae*.

Conn (H. J.). **Routine tests for the descriptive chart.**—*Pure Cult. Study Bact.*, 17, 3–4, 24 pp., 2 figs., 1949.

This leaflet, now in its 11th edition, has been carefully revised with the assistance of M. W. Jennison, L. S. McClung, C. A. Stuart, and C. E. Zobell. It contains the standard descriptive chart and the descriptive chart for instruction as issued by the Society of American Bacteriologists for characterizing bacterial species. The leaflet describes methods intended primarily for aerobic saprophytes.

Patel (M. K.) & Moniz (L.). **Xanthomonas desmodii-gangeticii, sp. nov., Uppal, Patel and Moniz; a new bacterial leaf-spot of Desmodium gangeticum DC.**—*Curr. Sci.*, 17, 9, p. 268, 1948.

Xanthomonas desmodii-gangeticii, which is responsible for the formation of pale yellow, water-soaked, circular spots on the lower surfaces of *Desmodium gangeticum*

leaves at Bassein, Bombay, differs from the agents of other bacterial leaf spots on legumes in its host range, morphological and cultural characters, and biochemical reactions.

Patel (M. K.) & Moniz (L.). **Bacterial leaf spot of Desmodium gangeticum DC.**—*Indian Phytopathology*, 1, 2, pp. 137–141, 1948 [? 1949].

This information has already been noticed from another source [see preceding abstract.]

Jakowska (Sophie). **Effects of Bacterium tumefaciens on Allium cepa.**—*Phytopathology*, 39, 9, pp. 683–705, 15 figs., 1949.

At Fordham University, New York, the author tested the susceptibility of Yellow Globe onion bulbs, grown in tap water, to needle-prick inoculation with *Bacterium tumefaciens*. Smith and Quirk, in their studies on the immunity of *Begonia* [*lucerna*] from crown gall [*R.A.M.*, 6, p. 19], listed onion as one of the plants unlikely to contract the disease, and no reports of its occurrence on this host have, in fact, been found. In the experiments herein described, which were conducted in moderate light at 24° to 26° C. (and in a few instances at 30°), over 30 bulbs developed an abnormal localized overgrowth in about 13 days after inoculation, while a similar number reacted negatively. In 15 cases infection was induced by the application of diseased tissue to healthy plants.

The effects of the pathogen differed from those described on other hosts. The excrescence was localized on the lower portion of the scales and the stem base. Stem proliferation in a horizontal direction and an increase in the root-bearing area were constant features of infection; there was also a definite curvature of the leaves at their bases in a limited region of the bulb. Progressive necrosis, however, was the primary result of infection, and the abnormal stem and leaf growth may have been a secondary consequence. The roots and seedlings were immune from attack by *Bact. tumefaciens*. Polyploidy appeared to be restricted to the cortex near the leaf meristem and possibly the leaves, but it is not a marked feature of infection.

De Ropp (R. S.). **The action of antibacterial substances on the growth of Phytomonas tumefaciens and of crown gall tumor tissues.**—*Phytopathology*, 39, 10, pp. 822–828, 1949.

At the New York Botanical Garden six strains of *Phytomonas* [*Bacterium*] *tumefaciens* were grown in broth culture in the presence of the following antibiotics: penicillin G [*R.A.M.*, 28, p. 635], streptomycin [ibid., 27, p. 556], chloromycetin [ibid., 27, p. 535], patulin [or clavacin: ibid., 27, pp. 453, 488], streptothricin [ibid., 27, p. 203], aureomycin (A 377 hydrochloride), aspergillic acid, and tolu-*p*-quinone. Dr. Annette Hervey undertook this phase of the investigation, using the method of serial dilution previously described [cf. ibid., 26, pp. 258, 556]. The maximum degree of activity was exerted by aureomycin, followed by chloromycetin, streptomycin, and streptothricin, but for some reason as yet unknown the sensitivity of the several strains to the antibiotics varied greatly. For instance, growth inhibition in the case of strain A6 required a dosage of 1γ per ml. aureomycin as compared with only 0·01 for SP (42-hour readings).

Fragments of normal and bacteria-free tumour tissue of sunflower and *Vinca rosea* were cultured on nutrient agar containing different concentrations of commercial penicillin, penicillin G, and streptomycin. At 500γ per ml. both penicillins inhibited tumour tissue growth and stimulated normal development, chiefly through increased root production, an effect attributed to traces of indole-acetic acid. Streptomycin was more active than penicillin in the inhibition of tumour tissue growth, being effective at 50γ per ml.

When sterile slices of carrot tissue were inoculated with *Bact. tumefaciens* and treated one day later with penicillin G or streptomycin, both substances inhibited tumour formation to some extent, the latter being the more active of the two. The tumours, once formed, did not regress under the influence of streptomycin, though their growth rate was retarded, the drug apparently acting on the bacteria rather than on the galls themselves.

CIFERRI (R.). **Geographic distribution of the great epidemic Cacao diseases of Venezuela.**—*Nature, Lond.*, 164, 4181, p. 1058, 1949.

After a thorough survey of cacao diseases in Venezuela the author states that the transference of witches' broom (*Marasmius perniciosus*) and watery pod disease (*Monilia roreri*) [*R.A.M.*, 21, p. 324] from the western to the eastern zone is prevented by a central irrigated area of cacao cultivation, free from both diseases, in the State of Aragua on the semi-arid coastal belt of the Caribbean Sea where the best Venezuelan [ibid., 28, p. 386] cacao is grown. Witches' broom is present in the eastern zone and the *M. roreri* in the western. The ecological environment (good irrigation and shade) in Aragua appears to be unfavourable for the establishment of both diseases.

PETIT (A.). **Laboratoire de cryptogamie.** [Cryptogamic laboratory.] *Ex* **Rapport sur les travaux de recherche effectués en 1947.** [*Ex* Report on research work carried out in 1947.]—*Bull. Serv. bot. agron. Tunis.* 9, pp. 23–28, 1948.

A correlation was established between the intensity of disinfection by hot water treatment (duration and temperature) of cereal grain against smuts [*Ustilago* spp.: *R.A.M.*, 26, p. 337] and the density of sowing; in normal conditions the treatment sometimes requires that 2·5 times the proportion of non-germinated seeds should be added to secure a normal stand. Treated seed stored at La Manouba remains in good condition for less than a year; in one small test with 200 seeds germination after just over a year was reduced by 47 per cent. and germinative energy by 67 per cent., as compared with seed from the last harvest.

Wheat seed is treated at La Manouba by one immersion in water at 45° C. followed immediately by a second for 10 minutes at 52°, and drying five times at approximately 35°, 52°, 51°, 51°, and 56·5° [cf. ibid., 28, p. 121]. It was found that it was only when the temperature rose to 52° (second drying) that disinfection was almost complete. It is the drying process which causes the greatest decrease in germinative ability. Consequently it is best to cool the grain in dry air. The percentage germination (g), germinative energy (i) (both in comparison with a control), germinative ability ($g \times i$), and the quantity of treated seeds required to be added to 100 treated seeds to obtain a germinative ability equivalent to 100 untreated seeds, were 99·5, 91·3, 91, and 10, respectively, after two dryings, the corresponding figures after five dryings being 95, 86·4, 82, and 22.

Further evidence was obtained that dusts with a basis of cupric chloride (7 per cent. copper) protect wheat against bunt [*Tilletia caries* and *T. foetida*] when used in an aqueous suspension (3 per cent. dust); reduction in germination is less marked than with copper sulphate with an equivalent amount of metal and fungicidal efficacy is much greater. Copper acetate dusts can also be used in suspension, but their fungicidal effect is limited.

PETIT (A.). **Laboratoire de cryptogamie.** [Cryptogamic laboratory.] *Ex* **Rapport sur les travaux de recherche effectués en 1948.** [*Ex* Report on research work carried out in 1948.]—*Bull. Serv. bot. agron. Tunis.* 15, pp. 19–24, 1949.

In a test of wheat varieties for resistance to black rust [*Puccinia graminis*: *R.A.M.*, 26, p. 444], carried out in Tunisia, among the most resistant varieties

of 260 tested (four plants each), were two lines of Kenya, a selection from the hard wheat Sindyouk×Mahmoudi, and Mahmoudi 552.

Wheat seed treated commercially against smut [*Ustilago tritici*: see preceding abstract] is still in good condition after storage until March or April. An addition of 50 per cent. treated seeds [to make up for loss of germination] gave almost the same density of seedlings in April as in November and showed on 29th April a growth vigour equal to 75 per cent. of that of the control. After one year's storage, however, even in the best conditions, an additional 80 per cent. of seeds becomes necessary. In further studies on the effects of the various phases of the hot water treatment it was again confirmed that disinfection is almost complete (0·1 per cent. smut on 8,000 ears compared with 3 per cent. on the untreated) after the wet seed has been exposed to a temperature of 52°. Drying completes the elimination of smut (0 per cent.). Treated seed should be sown at a minimum rate of 150 kg. per ha.

Experiments in 1948 showed that grain of the soft wheat Florence×Aurore can tolerate a temperature over 52° for a short time, providing there is a rapid fall during the first few minutes of the immersion. This occurs with a weight of seed equal to about one-tenth the weight of the water, using a 30-l. container. Tests with 200 seeds showed that after 60 minutes at 57° to 51° only one smutted ear per 15,000 occurred in the subsequent crop, but 58 per cent. grain must be added to make up the germination per cent. After 60 minutes at 56° to 52° there were no smutted heads in 15,000.

When wheat seed not submitted to hot water treatment was treated with hexachlorobenzene, bunt [*Tilletia caries* and *T. foetida*: cf. ibid., 23, p. 333] was completely eliminated. Good results were also obtained with almost pure, finely divided tetracupric oxychloride, and, in particular, with cupric chloride dusts. Cuprous chloride, used as a standard of comparison, is the most effective of the mineral copper salts.

Prasada (R.). **Studies on the formation and germination of teliospores of rusts. I.**—*Indian Phytopathology*, 1, 2, pp. 119, 126, 1948 [? 1949].

Studies of spore formation and germination of *Puccinia graminis tritici* [*R.A.M.*, 19, p. 695; 20, p. 199], *P. triticina*, *P. glumarum*, *P. penniseti* [see next abstract], and *P. purpurea* at the Rust Research Laboratory, Simla, showed that in the last three the uredo stage was followed by teleutospore formation irrespective of the growth stage of the host, whereas teleutospores of *P. graminis tritici* usually developed on mature plants and those of *P. triticina* under special climatic conditions. The wheat variety I.P. 114 appears to possess properties which induce the formation of teleutospores of *P. triticina* freely at all seasons. The teleutospores of all these rusts retained viability longest when stored dry at 5° to 7° C. A rest period (30 days) was necessary only for the teleutospores of *P. graminis tritici*. Teleutospores formed in cold weather germinated abundantly and consistently; their viability was reduced by exposure to high temperatures after formation. Temperatures between 12° and 18° favoured germination, while alternate wetting and drying proved beneficial in every case.

Ramakrishnan (T. S.) & Soumini (C. K.). **Studies on cereal rusts. I. Puccinia penniseti Zimm. and its alternate host.**—*Indian Phytopathology*, 1, 2, pp. 97–103, 1 pl., 4 figs., 1948 [? 1949].

In fresh collections of *Puccinia penniseti* [*R.A.M.*, 20, p. 570] on *Pennisetum typhoides* and *P. leonis* in Madras the uredospores had long, hyaline pedicels and paraphyses, and there were partitions in the teleutosori. Pycnia and aecidia were produced on eggplant after infection with basidiospores, the aecidiospores infecting *Pennisetum typhoides*. A complete, emended description of the fungus is provided.

The epiphyllous, subepidermal, ovate to globose, paraphysate, orange-yellow pycnia measure 110 by 140 μ, and the oval to oblong pycnospores 4 to 8 by 2·5 μ. The salmon-orange, hypophyllous or rarely epiphyllous, columnar aecidia, sometimes present on the petiole, are arranged in irregular, concentric circles and are up to one mm. high; the hyaline, polygonal, verrucose peridial cells are 23 by 20 (16 to 30 by 14 to 25) μ, while the catenulate, globose to angular, yellowish-orange, smooth aecidiospores measure 21 by 18 (16 to 25 by 12 to 21) μ.

Straib (W). **Weitere Beiträge zur Kenntnis der Spezialisierung der Getreideroste und des Leinrostes.** [Further contributions to the knowledge of specialization in the cereal rusts and in Flax rust.]—*Arb. biol. Anst.* (*Reichsanst.*), *Berl.*, 23, 2, pp. 233–263, 19 figs., 1941. [Received October, 1949.]

The following results were obtained in further experiments in Germany to elucidate the conditions affecting specialization in *Puccinia glumarum*, *P. graminis*, *P. coronata* [*R.A.M.*, 17, p. 233; 21, p. 410 *et passim*], and *Melampsora lini* [ibid., 21, p. 489]. In all four species divergences in pathogenicity between the several physiologic races are accompanied, in part, by clear-cut differences in the germination physiology of the uredospores and in their dimensions.

Barley from Bavaria and the Tyrol yielded a new race of *P. glumarum* (48) [ibid., 28, p. 322] which proved highly pathogenic to the varieties Peragis, Heils Franken, and Ackermanns Bavaria, resistant to the races (23 and 46) hitherto recognized in Germany. In this respect it resembles race 24, previously detected in France, but there is a well-marked difference between the two in the growth habit of their uredo germ-tubes. New races of yellow rust were also collected on wheat (three in Germany, numbered 49, 50, and 51, and one in [the former] German East Africa, 52). From 33 samples of wheat infected by *P. graminis* 18 distinct physiologic races were isolated. There were recognizable differences in their physiology of germination, though not as striking as in the case of yellow rust.

Extensive inoculation experiments with the aecidial stage of *P. coronata* from *Rhamnus frangula* and *R. cathartica* again demonstrated the paucity in this material of races pathogenic to oats. It was impossible, moreover, with any certainty to refer the forms of crown rust on these two hosts to the formae speciales erected by Klebahn and Eriksson. Some of the grass races attacked a much wider host range than the formae speciales hitherto described. As regards uredospore dimensions, too, *P. coronata* was found to represent a continuous variation series of specialized forms, the maximum spore size occurring in the races transmissible to oats.

Twelve new races of *M. lini* were isolated from flax, two (Lc–1 and Lc–2) from samples originating in Latvia and the rest (D5 to D14) from East Prussia. Some of them showed well-marked differences in temperature relations and in the number of branches on the germ-tubes.

Brown (A. M.) & Johnson (T.). **Studies on variation in pathogenicity in leaf rust of Wheat, Puccinia triticina Erickss.**—*Canad. J. Res.*, Sect. C, 27, 5, pp. 191–202, 1949.

Infection studies at the Dominion Laboratory of Plant Pathology, Winnipeg, with mixtures of races 9 and 15 and of races 5 and 9 of leaf [brown] rust (*Puccinia triticina*) [*R.A.M.*, 27, p. 120; 28, p. 622] did not produce any evidence that nuclear exchange occurred between the mycelia in the uredial stage. In greenhouse infection tests with native *Thalictrum* spp., aecidia were produced on *T. dasycarpum*, pycnia only on *T. dioicum* and *T. polygamum*, and there was no infection of *T. venulosum*. There was abundant aecidial production on the introduced species *T. glaucum* and *T. dipterocarpum*. No infection of *T. dasycarpum* and *T. venulosum* occurred out-of-doors compared with heavy aecidial production on *T. glaucum*. From selfing studies of known physiologic races on *T. glaucum*, a culture of race

5 appeared to be homozygous, whereas one of race 3 was heterozygous giving rise to races 3, 15, 32, 68, and three undescribed ones. A culture of race 76 was heterozygous for both pathogenicity and uredospore colour, the latter being two different shades of yellow as well as the normal colour. Most of the yellow strains were weakly pathogenic.

Watson (I. A.) & Waterhouse (W. L.). **Australian rust studies. VII. Some recent observations on Wheat stem rust in Australia.**—*Proc. Linn. Soc., N.S.W.*, 74, 3–4, pp. 113–131, 2 pl., 1949.

Continuing their studies on Australian rusts [cf. *R.A.M.*, 21, p. 283] the authors, in reviewing the tests made since 1941, state that the race of stem rust (*Puccinia graminis*) [ibid., 29, p. 15] for many years regarded as race 34, has not been collected since 1942 and it is considered that race 126B [ibid., 28, p. 450] represents a mutation from it. Eureka is still highly resistant in the absence of race 126B. Variety Kenya 117A [loc. cit.] is of special interest, being resistant to race 15B in the United States [ibid., 25, p. 298] as well as to 126 and 126B in Australia.

Fajersson (F.). **Weibulls Original Arosvete.** [Weibulls Original Aros Wheat.]—*Agric. Hort. Genet.*, 6, pp. 146–155, 1948. [English and German summaries. Abs. in *Field Crop Abstr.*, 2, 4–5, p. 237, 1949.]

Weibulls Original Aros wheat, placed on the market in 1947, was produced from the cross Äringo × Ergo. It surpassed Ergo in yield by 4·1 per cent. on the average of 154 trials in the provinces of Central Sweden. It shows good resistance to *Puccinia triticina* [*R.A.M.*, 17, p. 733] and *Erysiphe graminis* [ibid., 3, p. 425], and is equal to Ergo in straw strength, quality, and weight and superior in winter-hardiness and baking capacity.

Pugsley (A. T.). **The inheritance of resistance to three races of Tilletia foetida and two races of T. caries in a cross between White Federation 38 and Selection 1403 Wheats.**—*J. Genet.*, 49, 3, pp. 177–182, 3 graphs, 1949.

Further studies on resistance to bunt (*Tilletia caries* and *T. foetida*) in Australian wheats [cf. *R.A.M.*, 24, p. 311] were made at the Waite Agricultural Research Institute, Adelaide, to investigate the relationship of Briggs's M and H genes to three races of *T. foetida* ocurring in South Australia [ibid., 13, p. 361]. The F_3 families of a cross between Selection 1403 (HH, mm) and White Federation 38 (hh, MM) were tested for their reactions to three collections of *T. foetida* and to two of *T. caries* (13, probably the same as T1, and 8). Collection 7 (*T. foetida*) resembles L1, collection 11 resembles L3, and while collection 9 originally appeared similar to L4, it now seems to resemble more closely L14 [ibid., 25, p. 209]. Both Selection 1403 and White Federation 38 were resistant to collections 7 and 13, and susceptible to 8; Selection 1403 was resistant to 9 and susceptible to 11, while the reverse held for White Federation 38. On the basis of the reaction of each family to these collections, it has been found possible to identify the genotypes of the F_2 plants from which such families were derived. Resistance to collections 7 and 13 is provided by either the HH or MM gene, but neither is effective in controlling 8. HH is effective in controlling 9 but is ineffective against 11, while the reverse is true of MM.

Further work employing the M gene is required to determine the conditions under which cross-bred wheats are either resistant or susceptible, and should be extended to include other known 'resistant' genes in order to place the breeding of bunt resistant wheats on a much sounder basis. Such data should make possible the preparation of a table for the classification of the physiologic races of *T. caries* and *T. foetida* wherein known genes would replace the present arbitrary selection of varieties.

GLYNNE (MARY D.) & MOORE (F. JOAN). **Effect of previous crops on the incidence of eyespot on winter Wheat.**—*Ann. appl. Biol.*, 36, 3, pp. 341–351, 1949.

Surveys of winter wheat made in July and August each year from 1939 to 1946 showed that *Cercosporella herpotrichoides* [*R.A.M.*, 26, p. 193; 27, p. 278; 28, p. 619] occurs throughout Britain, incidence largely depending on previous cropping and on weather [loc. cit.]. Examination of 551 crops on land where the cropping for the four preceding years was known showed that where neither crop had been grown for four years, the proportion of wheat crops with over 70 per cent. infected straws was 2 per cent., the average number of infected straws being 6 per cent.; where three or four such crops had been grown the corresponding figures were 45 and 55 per cent., respectively. Incidence was increased by high spring rainfall, early sowing, and dense planting and was reduced by the reverse conditions. If conditions are very wet the disease may sometimes be severe in the second crop of wheat on newly ploughed grassland. Oat crops are much less susceptible than wheat or barley, but in some one-third of the straws were infected.

D'OLIVEIRA (B.). **Aecidia of Barley dwarf rust.**—*Nature, Lond.*, 164, 4177, pp. 880–881, 1949.

In inoculation experiments carried out from December, 1948 to May, 1949 at Sacavém, Portugal, three strains of *Ornithogalum pyrenaicum*, one from Dr. Dennis [*R.A.M.*, 27, p. 560], a Dutch one, and one from Coimbra (Portugal) were readily infected by sporidia from teleutospores of *Puccinia hordei*. Another Portuguese strain of *O. pyrenaicum* was immune [cf. ibid., 20, p. 354]. All the strains of *O. narbonense* and *O. umbellatum* tested, except one from each species, were congenial to *P. hordei*. A number of inoculated seedlings of *O. nutans* showed all the degrees of susceptibility to the gametophytic stage of the rust. Many other species of *Ornithogalum* also proved congenial.

JONES (E. T.). **The breeding of disease-resistant varieties of Oats. Part II. Inheritance of disease-resistance.**—*Emp. J. exp. Agric.*, 17, 68, pp. 205–214, 1949.

Continuing his survey of investigations on the breeding of disease-resistant oats [cf. *R.A.M.*, 28, p. 625], the author defines his use of the term 'resistant variety', discusses, with reference to the literature (43 titles), the inheritance of resistance to loose and covered smuts [*Ustilago avenae* and *U. kolleri*, respectively] and to stem and crown rust [*Puccinia graminis* and *P. coronata*, respectively], and describes recent progress in breeding resistant varieties and the development of breeding techniques.

STANTON (T. R.). **New varieties of Oats from Bond crosses resistant to Victoria blight.**—*Circ. U.S. Dep. Agric.* 795, 7 pp., 2 figs., 1949.

Under the headings of 'better varieties obtained from crosses with Bond', 'origin of certain parent varieties', 'some distinguishing characteristics', and 'sources of seed', the author presents the available information concerning 13 varieties of oats resistant to *Helminthosporium victoriae* [*R.A.M.*, 28, p. 14; 29, p. 81] now available for growing or for planned early distribution. They are Clinton, Benton, Cherokee, Bonham, Advance, Shelby, Eaton, Mohawk, Bonda, Mindo, Andrew, Zephyr, and Nemaha. Particulars are also given of Florida 167 and Camellia, suitable for cultivation only in the south.

JOHNSON (T.). **Inheritance of pathogenicity and urediospore color in crosses between physiologic races of Oat stem rust.**—*Canad. J. Res.*, Sect. C, 27, 5, pp. 203–217, 3 diags., 1949.

In studies on crosses between physiologic races of oat stem rust (*Puccinia graminis* var. *avenae*) at Winnipeg [cf. *R.A.M.*, 20, p. 158], in the F_1 generation

from races 7 (orange uredosori) and 11 (red) (formerly race 10a) [ibid., 19, p. 399], the medium-sized uredosori (type 2 infection) formed by race 11 on the oat variety White Tartan were dominant to the large (type 4) uredosori of race 7, and the small (type 1) uredosori of race 7 on the variety Richland were dominant to the type 4 formed by race 11 on the same host. Races 11 and 7 were found to be homozygous for colour of uredosori. In the F_2 generation of the cross race 11 × race 7 on White Tartan and Richland, the dominant and recessive infection types appeared in a ratio of 9:7, which suggests that their inheritance is governed by two pairs of complementary genes and that the genes governing the infection types on these two varieties associate at random to produce the races 1, 11, 3, and 4. These races occurred in the F_2 in a ratio of 31:20:22:12; the expected ratio was 27:21:21:16. On the variety Sevnothree (a selection from Joanette Strain and identical with it as regards infection types) 84 of 85 F_2 cultures from the same cross produced type 1 uredosori, thus resembling races 1 and 11. One F_2 culture only produced race 7, type 4 uredosori. It is concluded from this study and from crosses between races 1 and 2, that the cytoplasmic influence of the protoaecidium (maternal) [loc. cit.] seen in the F_1 generation persists in the F_2 and F_3. The distribution in these generations of the red and orange uredospore colour suggests that it is governed by a single pair of genes.

Miller (P. R.). **Downy mildew of Oats in new areas.**—*Agric. Chemicals*, 4, 3, pp. 55, 57, 1949.

Downy mildew (*Sclerospora macrospora*) of oats was reported by R. M. Caldwell, R. R. Mulney, and T. R. Stanton for the first time in Indiana in 1946 and 1947 in nursery plantings on the Purdue Soils and Crops Farm at Lafayette. Infection approached 100 per cent. in 1947. Both years were characterized by unusually moist soil conditions. The disease was also reported for the first time at Aberdeen, Idaho, in 1948 [cf. *R.A.M.*, 26, p. 541].

Ramakrishnan (T. S.) & Reddy (G. S.). **Artificial infection of Sorghum with long smut.**—*Curr. Sci.*, 18, 11, p. 418, 1949.

In May, 1949, a severe outbreak of long smut of sorghum (*Tolyposporium ehrenbergii*) [*R.A.M.*, 25, p. 32] occurred in several localities in India. In inoculation experiments conducted at Coimbatore, a suspension of germinating spores poured inside the sheath of the boot leaf of Co 11 in the field before the ears emerged caused sori to develop after 15 days. A.S. 7589 and 7571 were also infected by this method in a pot culture house. It is concluded that infection takes place through the young flower before the ear emerges from the boot leaf.

Frezal (P.). **Viroses des Agrumes et cératite.** [Citrus viroses and the Orange fly.]—*Fruits & Primeurs*, 19, 208, pp. 394–395, 1949.

Brief descriptions are given of the symptoms and control measures of the most common and destructive virus diseases of citrus in Algeria, namely, psorosis [*R.A.M.*, 24, p. 225], of which type A is the most widespread, and lemon shell bark [ibid., 27, p. 471].

Moreau (C.). **Un Cercospora parasite des feuilles du Palmier à huile au Moyen Congo.** [A *Cercospora* parasitic on leaves of Oil Palm in the Middle Congo.]—*Rev. Mycologie, Suppl. colon.*, 12, 1, pp. 37–38, 3 figs., 1947. [Received 1949.]

During 1947, some leaves from oil palms bearing large, withered areas covered, particularly on the lower surface, by a fine layer of greenish-brown fructifications, were received from Etoumbi, near Fort Rousset, Middle Congo. Some conidiophores, 40 to 70 by 4 to 7 μ, were typical of the genus *Cercospora*, while others, measuring 100 to 500 by 5 to 8 μ, were grouped in a pseudocoremium. The spores

were ovoid and hyaline when young, later becoming pyriform or lageniform. After the appearance of a septum in the widest part, the upper half continued to lengthen becoming three- to seven-septate, while the lower half developed only two septa at the most. When mature the spores were slightly fuliginous, straight or slightly curved, five- to nine-septate, obclavate, and measured 40 to 75 by 7 to 11 μ.

Since this fungus is very close to *C. palmicola* in the size of the spores and the first type of conidiophores, the name *C. palmicola* f. *stilbacea* n.f., is proposed.

Kaşkaloğlu (N.). **Angular leaf spot of Cotton and seed treatment trials. Last seed dressing trials against angular leaf spot.**—*Mahsul Hekimi* (*J. Plant Prot.*), 2, 10–11, pp. 234–238; 12, pp. 268–269, 3 figs., 1949. [Turkish, with English summary.]

In some fields in Manisa Province, Western Anatolia, the incidence of angular leaf spot [blackarm] of cotton (*Pseudomonas* [*Xanthomonas*] *malvacearum*) [*R.A.M.*, 28, p. 523] reached 100 per cent. in 1949, but the average rate of infection was 40 per cent. The pathogen was isolated on a medium of dextrose and cotton juice. The percentages of diseased plants produced by infected and healthy seed were 35 and 14, respectively. In seed-dressing experiments the best results were obtained with sulphuric acid, which completely eliminated infection from the stands of the three sowings made on 7th June, 7th July, and 13th August, as compared with 14, 30, and 28, and 35, 20, and 31 per cent., respectively, in two lots of controls. The corresponding figures for graminon were 0, 11, and 13, and for tillex 0, 3, and 2 per cent., respectively.

In a final series of tests, concentrated sulphuric acid and formalin reduced the incidence of blackarm in the uninoculated controls from 26·8 per cent. to nil, but their application presents difficulties. Excellent results were also obtained with tillex (0·24), dry fusariol (0·67), and verisan (0·68), the corresponding figures for fusariol-neu, chloroble, and graminon being 0·91, 2·2, and 2·9, respectively.

Soviet scientists develop new varieties of Cotton.—*Soviet News*, *1948*, 2025, p. 4, 1948. [Received January, 1949.]

Soviet scientists working in Uzbekistan (Central Asia) have developed new varieties of cotton which are outstanding in yield, early ripening, and resistance to gommoz [blackarm] (*Bacterium* [*Xanthomonas*] *malvacearum*) [*R.A.M.*, 27, p. 475]. Crosses made between American varieties and those of India and Central Asia have yielded a cotton totally immune from this disease, which is the greatest scourge of the crop in the northern and more moist areas.

Reinking (O. A.). **Abacá disease studies : Davao, Philippine Islands.**—*Plant Dis. Reptr*, 33, 12, pp. 456–462, 1949. [Mimeographed.]

At the beginning of September, 1949, the author inspected several areas where abacá [*Musa textilis*] is grown in the Davao province, Philippine Islands. Mosaic (probably caused by one of the cucumber viruses related to *Marmor cucumeris*) [? a strain of cucumber mosaic virus: *R.A.M.*, 27, p. 236] was the most serious and widespread disease, mainly due to the planting of infected material. New plantings in the Calinan region south-west of Davao City had 100 per cent. infection, those in the Tigato area at least 60 per cent., and older plantings 2 to 3 per cent. Mosaic was also present in the old Ohta Development Company, the Mental area, and in the Dumoy–Davao region. In the Philippine Islands the disease has not been observed on bananas. The aphis vectors [loc. cit.] cannot be controlled satisfactorily, but the disease can be held in check. For example, weed hosts of the virus and insect vectors in the vicinity of plantations can be eliminated either by the use of weed killers (ammate and 2,4-D were fairly effective in preliminary tests), or by planting the crop at distances of 2·5 by 2·5 m. or 3 by 3 m.

Maize and the natural hosts of *Aphis gossypii* (*Canna indica*, cotton, tomato, and melon) should not be planted on or near plantations. Introduction of infected planting material into disease-free plots must be prevented. Where incidence is low all diseased plants should be dug up immediately and burned on the spot and the adjacent vegetation and soil sprayed with a nicotine and soap solution. If infection is severe, all infected plants must be eradicated and the area replanted with disease-free material.

Tangongon abacá plants in a plantation with a high underground water table at Dumoy, Davao City, were affected with dry sheath rot (*Marasmius* sp.) [ibid., 20, p. 579] and stem rot (*Helminthosporium torulosum*) [ibid., 14, p. 312]. Both diseases are of minor importance and prevalent only in low, poorly drained areas. Vascular disease, due partly to *Bacterium* [*Xanthomonas*] *solanacearum* [ibid., 19, p. 346], and Panama disease or wilt (*Fusarium oxysporum* f. *cubense*) [ibid., 21, p. 66; 24, p. 371] occur only in the upland regions (about 2,000 ft.), not visited by the author. There has been no evidence of bunchy top virus [ibid., 27, p. 421] in recent years, the eradication methods used before the war having proved to be fully effective.

Kamat (M. N.) & Patel (M. K.). **Some new hosts of Oidiopsis taurica (Lév.) Salmon in Bombay.**—*Indian Phytopathology*, 1, 2, pp. 153–158, 1 pl., 1948 [? 1949].

Oidiopsis taurica [*R.A.M.*, 26, p. 532; 28, p. 91] was collected by the authors in India on a number of hosts, including *Impatiens balsamina*, *Tagetes* sp., *Phlox drummondii*, *Nasturtium* sp., and pigeon pea. Cross-inoculation experiments showed it to be highly specialized, infecting only the host from which the inoculum was taken, e.g., *I. balsamina*, *Tagetes* sp., pigeon pea, *Cyamopsis psoraloides*, and chilli pepper.

Brierley (P.). **Diseases of Amaryllidaceae, excluding those of Allium and Narcissus.**—*Herbertia*, 15 (*1948*), pp. 113–119, 1949.

This survey of diseases of amaryllids, based mostly on the literature, contains sections on red leaf spot (*Stagonospora curtisii*) [cf. *R.A.M.*, 23, p. 79; 27, p. 275], mosaic [ibid., 23, p. 18] and other virus diseases, and diseases reported on individual genera. None of the mosaic diseases has been shown to be transmissible by natural agents, by experimental techniques, or by seed. For the control of red spot, removal of diseased material and at least one annual cleaning of the bulbs is recommended. A two hours' soak of dormant bulbs in formaldehyde solution (1–200) is effective in eliminating the bulb-borne phase of the disease. Susceptible amaryllids should not be planted in the vicinity of *Crinum* and *Narcissus*, especially Paperwhite and Soleil d'Or, which are common sources of the pathogen. In the greenhouse the plants should be properly spaced and the foliage kept dry.

Williamson (C. E.). **A recently observed effect of diseases on plants.**—*N.Y. St. Flower Grs' Bull.*, 49, pp. 3–4, 1949. [Abs. in *Chem. Abstr.*, 43, 21, p. 8458, 1949.]

The production of ethylene by diseased plant tissues appears to be fairly general. The examples cited are rose black spot [*Diplocarpon rosae*], cherry shot hole [*Clasterosporium carpophilum*], snapdragon [*Antirrhinum majus*] rust [*Puccinia antirrhini*], chrysanthemum rust [*P. chrysanthemi*] and *Septoria* leaf spot [? *S. chrysanthemella*], and *Alternaria* leaf spot of carnation [*A. dianthi*]. The gas was detected by the effect of the emanations on tomato plants and etiolated pea seedlings. Relatively large amounts of ethylene were also produced by chrysanthemum and carnation flowers infected by *Botrytis cinerea*. Heavily infected flowers should not be packed for transport with species susceptible to ethylene

injury. The accumulation in greenhouses of plant refuse infected by *B. cinerea* may result in the formation of sufficient ethylene to cause the dropping of blossoms by certain plants in the absence of ventilation.

Benlloch (M.). **La heterosporiosis del Clavel en España (Heterosporium echinulatum (Berk.) Cooke).** [Heterosporiosis of Carnation in Spain (*Heterosporium echinulatum* (Berk). Cooke).]—*Bol. Pat. veg. Ent. agríc., Madr.*, 15, pp. 53–60, 6 figs., 1947. [Received January, 1950.]

In connexion with the recent discovery, for the first time in Spain, of *Didymellina* [or *Mycosphaerella*] *dianthi* [*R.A.M.*, 25, p. 185], in its conidial state (*Heterosporium echinulatum*), causing extensive and severe damage on outdoor carnations, the writer presents a concise account of the symptoms and effects of the pathogen, its morphological characters, the conditions promoting its development, and control measures [ibid., 25, p. 215].

McKay (R.). **The production of oospores by the downy mildew of Antirrhinums.**—*Gdnrs' Chron.*, Ser. 3, 126, 3263, p. 28, 2 figs. (pp. 27 and 30), 1949.

Studies made during May, 1949, in the Department of Plant Pathology, University College, Dublin, on *Antirrhinum* plants raised from seeds sown in February, have shown that while oospores occasionally occur in leaves affected by downy mildew (*Peronospora antirrhini*) [*R.A.M.*, 27, p. 475], particularly in the petioles, they are produced abundantly in the cortex of the stems of affected plants and even more freely in the cortex of the roots. The cortical tissues are disrupted and only fragments remain on the stripped central core. In view of these findings it is recommended that all seed-boxes in affected nurseries should be thoroughly sterilized with 2 per cent. formaldehyde to kill any oospores in remaining roots.

Green (D. E.) & Hewlett (M. Ann). **A Cineraria disease new to Great Britain.**—*Gdnrs' Chron.*, Ser. 3, 126, 3285, pp. 216–217, 2 figs. (1 on p. 218), 1949.

Cineraria (*Cineraria cruenta*) [*Senecio cruentus*] plants affected with an unusual leaf spot were received recently at Wisley from two different sources in Kent. The dark, water-soaked, surface spots, $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter, which rapidly turn brown to blackish-brown are scattered over the leaf. They enlarge quickly and often coalesce and kill large areas of the leaf. Dark spots may also appear on the petioles, causing the leaf to break off. An *Alternaria*, probably *A. senecionis* [*R.A.M.*, 25, p. 383], not previously recorded in England on cineraria, is responsible for the damage. Healthy young cineraria plants infected with spores of the fungus under humid conditions, developed the typical brown spots in about a week.

It has been established that the fungus can enter the leaf from either surface, so that a protective spray should be applied to both. A colloidal copper spray is recommended.

Schipper (Maria A. A.). **Een vlekziekte op bladeren van Orchideeën.** [A leaf disease of Orchid leaves.]—*Tijdschr. PlZiekt.*, 55, 4, pp. 246–248, 11 figs., 1949. [English summary.]

The brown, sunken, zonate spots developing on the leaves of *Eria javanica* and *E. hyacinthides* and the chlorotic ones formed on those of *Dendrochilum cobbianum* at the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, are attributed to infection by a species of *Glomerella* (stat. conid. *Colletotrichum*). The fungus was isolated on cherry agar and fructified profusely on maize meal, acid oatmeal, and lupin stems, imparting a pink coloration to the medium. It produced a white mycelium, orange acervuli (some of which contained slightly curved, septate setae, 80 to 130 by 3 to 4 μ), and conidia measuring 14 to 19 by 4·6 to 5 μ in culture,

15 to 18 by 4 to 6 μ on the leaf, and 16 by 4·5 μ on inoculated Jonathan apples. In hanging drop cultures and on desiccated plates chlamydospores also were formed, while the leaves bore black, roughly circular perithecia (80 to 140 μ in diameter), with asci, 60 by 11 μ, containing eight ascospores.

Many species of *Glomerella* have been described as agents of leaf spot, especially on Orchidaceae, and their imperfect state referred, often in the absence of cultural studies, to *Gloeosporium*. This attribution is incorrect, however, unless it can be demonstrated that no setae are formed in culture; if these organs are present, the species should be classed as a *Colletotrichum* [cf. *R.A.M.*, 21, p. 202, and next page].

Wade (G. C.). **Blind seed disease of Ryegrass.**—*Tasm. J. Agric.*, 20, 4, pp. 226–227, 1 fig., 1949.

The author discusses the symptoms, life-history, and control of blind seed disease (*Phialea temulenta*) [*R.A.M.*, 29, p. 101] of rye grass [*Lolium* spp.], which is known to occur in various parts of Australia, including Tasmania. Growers are advised to forward seed about three weeks after flowering to the Plant Pathologist, Hobart, to save the labour of harvesting infected seed likely to have low germination.

Das (M. C.). **Morphology and cytology of Tilletia holci on Holcus mollis L.**—*Indian Phytopathology*, 1, 2, pp. 165–181, 2 pl., 4 figs., 1948. [? 1949.]

In studies at the University of Edinburgh on the morphology and cytology of *Tilletia holci* [*R.A.M.*, 11, pp. 289, 304, *et passim*] on *Holcus mollis*, for which germination of the chlamydospores has not previously been recorded, spores treated with 10 per cent. bleaching powder solution and kept either in hanging drops of sterile water or in 1 per cent. agar outdoors at 1° to 3° C. for five to seven days and then removed to 18° gave about 50 to 80 per cent. germination in 48 hours. In the tissues of *H. mollis* the mycelium is irregularly branched and septate, while the hyphal cells are bi- to multinucleate. At the time of chlamydospore formation the end cells of the binucleate sporiferous hyphae swell, forming blister-like structures; nuclear fusion occurs and ultimately they develop into chlamydospores, forming only in the ovaries. Infected cells, especially those in the ovaries, undergo degeneration and finally disappear.

Hardison (J. R.). **A leaf spot of tall Fescue caused by a new species of Cercospora.** *Mycologia*, 37, 4, pp. 492–494, 1 fig., 1945.

A leaf spot on living leaves of *Festuca elatior* var. *arundinacea* collected in Kentucky in 1944 is caused by a fungus named *Cercospora festucae* n.sp. The spots were oval to elongate, 0·5 to 4 mm. in length, with a grey centre and purplish border. Conidiophores are almost straight, 3·5 to 5 by 50 to 800 μ, conidia long, acicular, 2 to 4 by 40 to 300 μ. At present the effects on the grass are mild.

Gremmen (J.). **Polythrincium trifolii Schm. en Kunze, parasiet van Klaver.** [*Polythrincium trifolii* Schm. & Kunze, a parasite of Clover.]—*Tijdschr. PlZiekt.*, 55, 4, pp. 249–250, 2 figs., 1949. [English summary.]

The mostly bicellular, light brown conidia of *Polythrincium* [*Cymadothea*] *trifolii*, the agent of clover black blotch in Holland, measure 19 to 23 by 8 to 12 μ and are readily detachable from the undulate conidiophores. Sections through the black protuberances found on the leaves at the end of October revealed stromatic layers of thick-walled, dark brown, angular cells of undifferentiated content, interspersed with groups of thin-walled, pale cells. Asci were not detected, but the stromata are believed to represent the perfect state of the fungus described by Killian as *Plowrightia* [*C.*] *trifolii* [*R.A.M.*, 2, p. 546; 14, p. 367].

Wollenweber (H. W.) & Hochapfel (H.). **Beiträge zur Kenntnis parasitärer und saprophytischer Pilze. VI. Vermicularia, Colletotrichum, Gloeosporium, Glomerella und ihre Beziehung zur Fruchtfäule.** [Contributions to the knowledge of parasitic and saprophytic fungi. VI. *Vermicularia, Colletotrichum, Gloeosporium, Glomerella* and their relation to fruit rot.]—*Z. Parasitenk.*, 14, pp. 181–268, 12 figs., 1947. [Received December, 1949.]

The authors' further studies on parasitic and saprophytic fungi in relation to fruit rot [*R.A.M.*, 25, p. 264] contain diagnoses of *Vermicularia dematium* (Pers.) Fr. var. *minor* Wr n. var. isolated from lupin (*Lupinus polyphyllus*) stems in the Berlin Botanical Garden and causing decay of experimentally infected apples; *V. dematium* var. *wallrothii* (Sacc. ut sp.) Wr n. comb. on vegetable marrow and *Cucurbita lagenaria* in Italy and Germany; *V. dematium* f. 1 Wr n.f., ubiquitous in Europe as a saprophyte on herbaceous plants and sometimes parasitic, e.g., on spinach leaves and quince and apple fruits; *Glomerella cingulata* (Stonem.) Spauld. & Schrenk var. *brevispora* Wr n. var. (*Gloeosporium versicolor* B. & C.), causing rot of apple, pear, *Musa* sp., tomato, and elder fruits and occurring on living or dead leaves of various orchids and in the decayed petioles of cyclamen, etc., in Europe and North America; *Glomerella cingulata* var. *crassispora* Wr n. var., causing leaf spot of coffee in a glasshouse in the Berlin Botanical Garden and found in its conidial state (*Gloeosporium aurantiorum*) on withered citrus leaves and on faded leaf spots on *Anthurium scherzerianum* and orchids; *Glomerella cingulata* var. *nigrans* Wr n. var. on living stems of *Hypericum perforatum* and other *H.* spp. in the Berlin Botanical Garden, and in its conidial state (*Gloeosporium orbiculare*) on melon and vegetable marrow fruits and cucumber leaves in Europe and North America; and *Glomerella cingulata* var. *minor* Wr n. var. on moribund fig leaves in a glasshouse at the Berlin Botanical Garden, and in its conidial state (*Gloeosporium elasticae*) on *Ficus elastica* and coffee in Africa and America (in Europe only under glass).

More or less severe rotting of pome fruits was caused by *V. dematium* var. *macrospora*, *V. circinans*, *Gloeosporium cocophilum*, *Glomerella cingulata*, and *G. lycopersici* in addition to the species already mentioned. The diagnoses of the known species have been amplified in respect of spore characters and the synonymy and host range of various species, e.g., *V. dematium*, considerably extended. The authors maintain the genus *Vermicularia* on the grounds of its fusiform to falcate conidia and abundance of setae, whereas in *Colletotrichum* the presence of setae is apparently inessential and variable. The species of *Gloeosporium* investigated were all conidial states of *Glomerella* except *Gloeosporium reesii*, but other perfect states of the genus include *Physalospora*, *Guignardia*, and *Pseudopeziza*. The border-line between *Colletotrichum* and *Gloeosporium* is not well defined since setae, which are usually present in the former genus, are not infrequently also a feature of the latter. The conidia at germination often become pluricellular and then resemble species of *Fusarium* with which they have also been confused. An attempt was made to segregate species of *Gloeosporium* into groups and to exclude certain groups from the genus.

Darpoux (H.). **Les avertissements agricoles.** [Agricultural spray warnings.]—*Bull. tech. Inform. Ingén. Serv. agric.*, [*1949*], 41, pp. 403–411, 5 figs., 1949.

The author discusses the system of spray warnings for the control of vine mildew (*Plasmopara viticola*) and apple and pear scab (*Venturia inaequalis* and *V. pirina*) as it exists in France [*R.A.M.*, 25, pp. 399, 434], and the determination of the most favourable dates for spraying.

The weather conditions during the 1930 and 1936 seasons were closely similar, but the yield of wine in central France in the latter year was 35 per cent. higher

than in 1930 owing to the fact that an anti-mildew forecasting service was functioning locally, but not in 1930. The increased value of the crop was estimated at 60,000,000 francs. In 1938 spray warnings [ibid., 24, p. 460] resulted in a saving of spray materials in the south-west of France valued at 200,000,000 francs. In 1941 [ibid., 25, p. 382], when copper sulphate was very scarce, growers who ignored the spray warning service sprayed too soon, with the result that their crops were ruined by late outbreaks of mildew; if no spray warnings had been issued that year, the losses incurred would have run into thousands of millions of francs. On the whole, two spray applications a year are saved, or 20 kg. copper sulphate per ha. For the whole country this amounts to 30,000 tons of copper sulphate or (in present conditions) 2,500,000,000 francs a year, not counting the cost of labour and depreciation of machinery.

The spray warnings against apple and pear scab have been functioning for too short a time for any figures to be given of the economies effected, but many growers consider that as a result of the spray warning services these diseases are now readily controllable.

Mulder (D.). **Aantasting van Sierappels door Appelschurft (Venturia inaequalis (Cooke) Wint.).** [Infection of ornamental Apples by Apple scab (*Venturia inaequalis* (Cooke) Wint.).]—*Tijdschr. PlZiekt.*, 55, 4, pp. 242–245, 1949. [English summary.]

Observations are described and tabulated on the reactions to scab (*Venturia inaequalis*) of 52 ornamental species and varieties of *Malus* [*R.A.M.*, 24, p. 320] examined at the Zuiderpark, The Hague, in 1948. Of these, 36 fell into the sections *Eumalus* and *Sorbomalus* as defined by Hendriks (Onze loofhoutgewassen, Wageningen, 1940). The following were resistant (all in the section *Sorbomalus*): *M. coronaria*, *M. glaucescens*, *M. ioensis*, *M. yunnanensis* var. *veitchii*, *M. tschonoskii*, *M. floribunda*, *M. arnoldiana*, *M. scheideckeri*, *M. atrosanguinea*, *M. sieboldii*, *M. zumi* var. *colocarpa*, *M. sargenti*, *M. fusca*, *M. toringoides*, and *M. gloriosa*, while the response of *M. soulardii*, in the same section, was doubtful. In the section *Eumalus* resistance was shown by *M. pumila* var. *lemoinei*, *M. prunifolia* var. Golden Gem, *M. micromalus*, *M. magdeburgensis*, *M. baccata*, *M. hartwigii*, *M. hupehensis*, *M. robusta*, and *M. sikkimensis*. The following, not yet assigned to either of the above-mentioned sections, were also resistant: *M. moerlandsii* (Profusion) and the hybrids Marshall Oyama, Allbred, Wintergold, Oekonomierat Dr. Echtermeyer, and Red Tip Crab.

Mitchell (A. E.). **Application of concentrate sprays with a conventional speed sprayer.**—*Agric. Engng, St Joseph, Mich.*, 30, 11, pp. 533–534, 2 figs., 1 diag., 1949.

At the Graham Experiment Station, Michigan State College, the following trial was conducted in 1948 to test the performance of an aerosol speed sprayer (model 29, John Bean Mfg Co., Division of Food Machinery Corp.) in the application of concentrate sprays to 30 Delicious and 22 Northern Spy apple trees for joint scab [*Venturia inaequalis*] and codling moth [*Carpocapsa pomonella*] control. Spray mixtures of double strength were compared with the conventional dilute sprays, using the former at half the quantity of the latter per tree. The nozzles were arranged in such a way as to deliver two-thirds of the spray material into the upper third of the tree. Eight treatments were given, beginning with liquid lime-sulphur at the green-tip stage and ending with a parathion insecticidal spray on 3rd September.

The incidence of early and late scab on 10 Northern Spy trees treated with the concentrate spray was 11·8 and 7·1 per cent., respectively, and for 12 given the conventional dilution 2·9 and 4·1, respectively. On the 16 Delicious trees treated

with the concentrate spray the percentages of early and late scab were 5·1 and 1·3, respectively, and on the 14 receiving the conventional dilution 2·9 and 0·5, respectively. These amounts (and also those of codling moth injury) were within the range of commercial control in respect of Delicious, but not for Northern Spy, which were larger trees. It would be better, therefore, to adapt the trees to the spraying equipment for the effective use of small-capacity machines.

VIENNOT-BOURGIN (G.) & DELASSUS. **Recherches sur le papery bark canker du Pommier en France.** [Researches on papery bark canker of Apple trees in France.]—*C.R. Acad. Agric. Fr.*, 35, 13, pp. 577–578, 1949.

During recent years, the branches and trunks of apple trees in Anjou, Normandy, and parts of Brittany have been dying slowly. The cortical zone flakes off, the reddish fibres of the pericycle partially adhering to the central cylinder. The trunk, mainly near the base, bears lenticular pustules on which the bark is reddened and soft, or there are conspicuous cortical ruptures, sometimes 20 cm. long, edged by shrivelled-up fragments of bark.

The medullary and perimedullary regions contained a fungus with septate, hyaline hyphae 2 to 5 μ in diameter, either isolated or arranged in thin bundles. In culture the hyaline, arcuate conidia grouped in wide-mouthed pycnidia measured 16·32 by 1 μ. The fungus is considered to be a new species of *Cylindrosporium*. Experimental inoculations [on apple] in the laboratory and field resulted in the formation of lesions identical with those described for papery bark canker as associated with *Stereum purpureum* [*R.A.M.*, 24, p. 153].

CHABANNES (J.), TROCMÉ (S.), & BARBIER (G.). **Observations sur la carence zincique du Pommier.** [Observations on zinc deficiency of the Apple tree.] —*C.R. Acad. Agric. Fr.*, 36 [? 35], 15, pp. 624–626, 1949.

The symptoms of zinc deficiency recently noted on apple trees in the Palatinate [*R.A.M.*, 28, p. 129] have since been observed on Calville apples at Versailles.

On 15th March, 1949, at bud-burst, eight severely affected trees were treated by spraying the wood with 5 per cent. non-neutralized zinc sulphate solution; on another tree, uniformly diseased, the branches on one side only were similarly sprayed. By 26th April the sprayed trees showed great improvement. Rosettes were much less numerous than on the unsprayed and most of the shoots were of normal length, the leaves being of the same colour and size as those on healthy trees. This improvement was maintained throughout the growing period, though the few rosettes which did form failed to develop into branches. A treatment with 1 per cent. zinc sulphate solution neutralized with 0·3 per cent. lime carried out on 26th April on the leaves of severely affected trees brought about a temporary improvement in leaf colour, but conferred no further benefit on the trees already sprayed. In August, both the treated and untreated trees developed intervenal necrosis of the leaves at the base of the branches, so that some other condition may be present in addition to zinc deficiency. The leaves of the healthy trees were found to contain at least twice as much zinc as those of the untreated, diseased trees.

FOSTER (H. H.). **Peach spray experiments for brown rot control in South Carolina during 1948.**—*Plant Dis. Reptr*, 33, 12, pp. 471–478, 1949. [Mimeographed.]

In tests conducted in South Carolina in 1948 eight sprays were evaluated for the control of brown rot (*Monilinia* [*Sclerotinia*] *fructicola*) of peaches [*R.A.M.*, 28, p. 446; 29, p. 34] in the field, during railway transport, and in storage. Spraying was started at blossoming on a block of 12-year-old Elberta trees. There was very little infection during the blossom period and only 7 out of 80 trees had some fruit

infected with brown rot five days before the first picking in July. The following schedules controlled the pathogen effectively during four days' transit and four days' subsequent storage at room temperature (75° to 85° F.): one or three blossom sprays of liquid lime-sulphur (1 gal. in 100 gals.), or three with phygon X-L (1 lb. to 100), followed by seven applications of wettable sulphur (6 lb. to 100); and two post-blossom applications of wettable sulphur followed by five of zerlate (1½ to 2 lb. in 100). Peaches held in cold storage for six days (36° to 45°) after harvesting and then ripened for three days at room temperature developed very little brown rot, while those held at room temperature for four days had in most cases more infection. Fruit from trees given three blossom sprays of liquid lime-sulphur followed by seven applications of wettable sulphur had least brown rot (0·5 per cent.); the zerlate schedule gave 2·5 per cent. infected, and the phygon X-L schedule 3·3 per cent. The last-named induced a dark streaking on the fruit.

Dominik (T.). **Przyczynek do znajomości metaplazji w komórkach roślinnych zabijanych przez grzyby.** [Contribution to the knowledge of metaplasia in plant cells parasitized by fungi.]—*Acta Soc. bot. Polon.*, 19, 1, pp. 56–78, 14 figs., 1948. [French summary.]

At the State Scientific Agricultural Institute, Poland, studies of necrotic subepidermal lesions on quince fruits infected by *Entomosporium maculatum* [*Fabraea maculata*: *R.A.M.*, 28, p. 38] showed that the necrotic tissues contain chemical substances not present in healthy ones. They include starch, aleurone grains of very different types, minute albuminoid granules resembling those of aleurone, pseudo-cystoliths, and an acid, reddish-brown pigment, which impregnates the whole diseased cell.

Vilmorin (R. de). **La sélection sanitaire du Fraisier.** [Health selection of the Strawberry.]—*C.R. Acad. Agric. Fr.*, 36 [? 35], 15, pp. 629–631, 1949.

Strawberry plants grown over large areas of France, e.g., in the neighbourhood of Plougastel and the valley of the Bièvre, are showing signs of degeneration. Two virus diseases affecting strawberries are known to be present in France, virus 1, the yellow edge virus, and virus 2, the crinkle virus [*R.A.M.*, 15, p. 817; 28, p. 342]. The local wood strawberry is highly susceptible to both. Healthy strawberry material obtained from abroad is being multiplied and so far has shown no sign of disease. The paper concludes with a brief summary of selection by the isolated block system [cf. ibid., 19, p. 481; 28, p. 341].

Merny (G.). **Les maladies de l'Ananas.** [Diseases of Pineapples.]—*Fruits d'Outre-Mer*, 4, 4, pp. 125–132, 8 figs.; 8, pp. 288–293, 3 figs.; 9, pp. 327–331, 3 figs., 1949.

Brief notes, based on a critical study of the literature of the subject and intended to provide phytopathologists with reliable information of a preliminary nature, are given on the symptoms, causal organisms, and control of some diseases of pineapple, found in different countries, including wilt (*Phytophthora cinnamomi*, *P. parasitica*, and other organisms) [cf. *R.A.M.*, 15, p. 378; 25, pp. 305, 460], heart and top rot (*P. cinnamomi*, *P. meadii*, and *P. parasitica*) [cf. ibid., 12, p. 303; 18, p. 503], green fruit rot (*P. meadii*) [cf. ibid., 9, p. 325; 14, p. 455], water blister, leaf spot, and base rot due to *Ceratostomella paradoxa* [ibid., 27, pp. 221, 375], and a number of minor rots associated with species of *Penicillium* and *Fusarium*, and other fungi.

The second article treats of pink disease due to *Phytomonas* [*Pseudomonas*] ? *amaranthi*, the diseases due to *Erwinia ananas* and *Phytomonas* [*Pseudomonas*] *ananas* [ibid., 17, p. 192], and yellow spot (tomato spotted wilt virus) [ibid., 22, p. 393].

The final paper deals with physiological disorders, including crook-neck [ibid., 28, p. 130], iron deficiency [ibid., 25, p. 127], zinc deficiency [ibid., 22, p. 143], and black heart [ibid., 21, p. 183].

PATEL (M. K.) & PADHYE (Y. A.). **Bacterial soft rot of Mango in Bombay.**—*Indian Phytopathology*, 1, 2, pp. 127–128, 1948 [? 1949].

From a soft rot of mangoes common in India from May to August the authors isolated a bacterium, which from its morphological and physiological characters and its pathogenicity to 15 different vegetable hosts, in addition to mango and mosambi (orange), is identified as *Bacterium carotovorum* [*Erwinia carotovora*].

PATEL (M. K.), KULKARNI (Y. S.), & MONIZ (L.). **Pseudomonas mangiferae-indicae, pathogenic on Mango.**—*Indian Phytopathology*, 1, 2, pp. 147–152, 2 pl., 1948 [? 1949.]

Most of the information in this paper has already been noticed from another source [*R.A.M.*, 27, p. 533]. *Pseudomonas mangiferae-indicae*, pathogenic to the mango, *Spondias mangifera*, and cashew (*Anacardium occidentale*) in India, does not infect maize, sorghum, cotton, tobacco, carrot, eggplant, tomato, bean [*Phaseolus vulgaris*], *Lathyrus sativus*, *Vinca* sp., sesame, or lemon; the cashew is only weakly susceptible.

CRANDALL (B. S.). **A new species of Cephalosporium causing Persimmon wilt.**—*Mycologia*, 37, 4, pp. 495–498, 1 fig., 1945.

The fungus causing wilt disease of persimmon [*R.A.M.*, 23, p. 367] in the south-eastern States of America was isolated from the wood of affected trees and is described as *Cephalosporium diospyri* n.sp. The species produces abundant ovoid, orange-pink spores on the dead host or in culture, 2·7 to 4·5 μ long (94 per cent.) by 1·8 to 5·4 μ; it is a faint pink colour in culture. It has been found in nature on the American persimmon (*Diospyros virginiana*) and on the oriental (*D. kaki*), which is nearly immune, but is often killed when grafted on susceptible *D. virginiana* roots. *D. ebenaster*, *D. texana*, and *D. lotus* have been successfully inoculated with varying degrees of susceptibility.

A new British power duster.—*World Crops*, 2, 1, p. 44, 2 figs., 1950.

The Long Ashton Power Duster, recently designed by Dr. Kearns and N. G. Morgan of Long Ashton and built by Messrs. Welding Industries, Ltd., of Bristol, can make applications from $1\frac{1}{2}$ lb. per acre upwards. Self-motored and mounted on a two-wheeled trailer chassis it has an automatic sack lift for tipping the dust into the 2-cwt. hopper. The dust flows through the feed gap at a uniform and adjustable rate, while the fan has a speed of 2,000 r.p.m. and a capacity of 2,000 cu. ft. of free air per minute. A swivel trunk with a vertical adjustment through 60° is fixed to the discharge port, and nozzles allowing various directions of delivery can quickly be fitted to it.

MCCALLAN (S. E. A.). **The nature of the fungicidal action of copper and sulfur.**—*Bot. Rev.*, 15, 9, pp. 629–643, 2 graphs, 1949.

The author discusses, with numerous references to the literature, the available information on the mechanism of the fungicidal action of copper in relation to cumulative action, atmospheric influence, plant and spore excretions, the dosage-response curve [*R.A.M.*, 28, p. 132], and the theory of variability. Sulphur fungicides are treated in relation to their action at a distance [cf. ibid., 27, p. 310], oxidation products, and particle size. A bibliography of 59 titles is appended.

Martens (P. H.). **Quelques remarques sur la détermination de la finesse des particules dans les produits phytopharmaceutiques.** [Some remarks on the determination of the fineness of particles in phytopharmaceutical products.]—*Parasitica*, 5, 3, pp. 83–86, 1949.

In phytopharmacy, to determine the rate and duration of fall of the particles of any given product according to Stokes's Law, its real density, the quantity of insoluble matter it contains, and the influence of the soluble materials on the density and viscosity of the encasing fluid all have to be determined.

When these methods were applied to a number of commercial products they showed that in each the insoluble particles varied in density and also in quantity from one product to another or even in one product made by different firms.

With the solution of the soluble part of the product there is a risk that the density and viscosity of the liquid medium may be altered. However, when most of the adjuvants used in phytopharmacy pass into solution the density and viscosity of the water remain unchanged provided the concentration of matter is not over 2 per cent. and their effect may therefore be ignored.

Schoene (D. L.), Tate (H. D.), & Brasfield (T. W.). **Use of quinones as fungicides.**—*Agric. Chemicals*, 4, 11, pp. 24–27, 73–77, 4 figs., 1 graph, 1949.

This paper reviews the published investigations of quinone fungicides and discusses their properties which are important in agriculture. Spergon [*R.A.M.*, 20, p. 241 *et passim*] and phygon [ibid., 23, p. 265 *et passim*] are the outstanding proprietary quinone compounds, but over fifteen quinones have since been reported as fungicides. Horsfall [ibid., 25, p. 128] has stated that 1,2-naphthoquinone is more toxic than 1,4-naphthoquinone. The 1,4-quinones are in general more useful as agricultural fungicides. Quinones from natural products embrace most of the known structures but none is used commercially. The mechanism of fungicidal action is discussed but little information is available. Unpublished data by E. C. Ladd demonstrate that reduction potentials of 1,4-benzoquinone and its methyl derivatives correlate well with toxicity but 2,3-dichloronaphthoquinone is much more toxic than *p*-benzoquinone though it has a lower reduction potential. It is concluded that some factor other than reduction potential alone is responsible for toxicity. The quinones are very active chemically. The effect of chlorination on the toxicity to fungi of *p*-benzoquinone was most pronounced in foliage tests. Chlorination of naphthoquinones also improved toxicity. The properties and uses of spergon and phygon are discussed in detail with reference to the literature.

Haskell (R. J.). **The role of alkyl mercury as a fungicide.**—*Agric. Chemicals*, 4, 8, pp. 30–32, 1949.

After discussing the number of plant diseases, of which at least 500 are seed-borne, and the annual losses from them in the United States, the author stresses the importance of seed treatment [*R.A.M.*, 27, p. 434] and the use of the organic mercury compounds [ibid., 22, p. 472], which can be used dry and make treatment easier and less costly. One firm is quoted as estimating a total increase in 1947 of 198,803 bush. in the yield of wheat, oats, barley, and flax, valued at $332,425, due to seed treatment with ceresan. Among the compounds mentioned are ethyl mercury chloride, ethyl mercury phosphate, ethyl mercury *p*-toluene sulfonanilide, and phenyl mercury urea. Other promising fungicides are phenyl mercury triethanolammonium lactate and phenyl mercury acetate. The saving by seed treatment in Kansas in 1947 was estimated at $28,000,000, and in Colorado at $4,200,000. In Pennsylvania, Vicland oats in five counties yielded 27½ bush. per acre from treated seed and 20 bush. from untreated. In 1948 62 per cent. of the wheat, oats, barley, and rye acreage in Minnesota, and North and South Dakota

was sown with ethyl mercury phosphate treated seed. Almost all the hybrid maize, 75 per cent. of the total maize planted, is treated before sale. Probably 60 per cent. of cotton seed [ibid., 27, p. 523; 28, p. 286] is treated in some States east of the Mississippi and 30 per cent. in the United States as a whole.

Agriculture in the Sudan.—xviii+974 pp., 85 pl., 123 figs., 14 maps (2 col.), London, Oxford University Press, 1948. 42*s.* net.

This well-illustrated book, with chapters by 28 authors, is a valuable work treating all aspects of agriculture in the Sudan from 1898 to 1945. It is intended as a reference book, but is written as far as possible in non-technical language. The first part deals with general aspects, the second with agriculture and farm animals, and the third with Province agriculture. References to the major crop diseases occur in the chapters describing the various crops and the varieties grown, the organization of research and the experimental farms, and the experimental work. The last has a section by F. Crowther (pp. 525–566) on major crop diseases, which deals in detail with blackarm (*Xanthomonas malvacearum*) [*R.A.M.*, 29, p. 79], leaf curl (virus) [ibid., 27, p. 473], and wilt diseases [ibid., 18, p. 391; 20, p. 162], due to a variety of causes, of cotton. The histories of the diseases in the Sudan are traced and control measures discussed. A section on plant breeding and plant introduction (pp. 567–593) includes an account of cotton varieties resistant to leaf curl and blackarm, and sorghum varieties including those resistant to smut (*Sphacelotheca sorghi*). The references are collected in two appendixes, one (4 pages) of general publications on agriculture in the Sudan, and the other (17 pages) of agricultural research. There is a glossary of Arabic and vernacular words.

Masefield (G. B.). **A handbook of tropical agriculture.**—viii+196 pp., Oxford, Clarendon Press, 1949. 12*s.* 6*d.*

Chapter XXIII (pp. 125–131) of this manual, intended primarily for the farmer, business man, or administrator, is concerned with the diseases of tropical crops in general, while information on some of great commercial importance or particular interest is also presented under the specific crop headings.

Clifton (C. E.), Raffel (S.), & Barker (H. A.). **Annual review of microbiology III.**—476 pp., Sanford, California, Annual Reviews, Inc., 2 figs., 10 graphs, 1949. $6.

In this review 19 authors have contributed papers summarizing current work in many fields of microbiology. J. Lederberg discusses bacterial variation [*R.A.M.*, 27, p. 10], J. Monod the growth of bacterial cultures, Dagny Erikson the morphology, cytology, and taxonomy of the Actinomycetes [ibid., 27, p. 513, 28, p. 514], W. W. Umbreit metabolism of micro-organisms, E. E. Snell their nutrition, C. A. Knight the constituents of viruses, W. C. Cutting the action of antibiotics *in vivo* [ibid., 28, p. 231], Helen Hart the nature and variability of disease resistance in plants, L. S. McClung recent developments in microbiological techniques, and J. Fong bacteriophage. Each paper is followed by a long bibliography, and there are author and subject indexes.

Quanjer (H. M.). **Plantenziektenkundig onderzoek in Amsterdam en Wageningen 1904–1949.** [Phytopathological investigation in Amsterdam and Wageningen 1904–1949.]—*Tijdschr. PlZiekt.*, 55, 4, pp. 233–241, 1949.

This is an expanded version of the author's farewell lecture, on the occasion of his retirement on 18th June, 1949, in which he gives an interesting survey of his work at the Phytopathological Institute in Wageningen from 1906 to 1949, preceded by two years at the 'Willie Commelin Scholten' Laboratory in Amsterdam.

Some outstanding features of the work and the personalities associated with the various lines of investigation are recalled.

MÄDE (A.). **Agrarmeteorologie und Pflanzenschutz.** *Ex* SNELL (K.). **Zeitfragen des Pflanzenschutzes.** [Agricultural meteorology and plant protection. *Ex* SNELL (K.). Topical problems of plant protection.]—Berlin, Gartenverlag G.m.b.H., 11 pp., 1949.

The study of agricultural meteorology and its applications to plant protection are discussed under various aspects, including the possibilities of modifying adverse weather conditions, such as frost, drought, and high winds, in favour of the plants by the provision of rational counter-measures; co-operation between meteorologists and plant-breeders; and the extension of investigations on microclimate to warehouses, granaries, cellars, and clamps used for the accommodation of stored products.

MORSTATT (H.). **Stand und Ziele wissenschaftlicher Pflanzenpathologie.** *Ex* SNELL (K.). **Zeitfragen des Pflanzenschutzes.** [Status and aims of scientific phytopathology. *Ex* SNELL (K.). Topical problems of plant protection.]—Berlin, Gartenverlag, G.m.b.H., 13 pp., 1949.

This is an interesting retrospect of the last half-century's progress in the field of plant protection, following the foundation of the German Biological Institute of Agriculture and Forestry, and includes discussions on the control of diseases and pests, antibiotics, the nature of parasitism, pathological anatomy, crown gall (*Pseudomonas* [*Bacterium*] *tumefaciens*), and pathological physiology.

RODRIGUEZ SARDIÑA (J.). **La epidemiología vegetal o epifitología.** [Plant epidemiology or epiphytology.]—*Bol. Pat. veg. Ent. agríc., Madr.*, 15, pp. 1–52, 1 fig., 1 diag., 9 graphs, 1947. [Received January, 1950.]

This is an exposition, based largely on the relevant chapters of Gäumann's treatise on plant infection [*R.A.M.*, 25, p. 173], of the factors involved in the development of epiphytotics. References are also made to a number of other important contributions to the subject, most of which have been noticed in this *Review*.

BALDACCI (E.) & CIFERRI (R.). **Saggio di una classificazione delle malattie delle piante su basi fisio- e morfopatologiche.** [An attempt to classify plant diseases on a physio- and morphopathological basis.]—*Atti Soc. ital. Pat.*, 1, 1, pp. 59–64, 1949.

The classification of the diseases of plants outlined in this article was made for a treatise on plant pathology, one volume of which has already been published [*R.A.M.*, 27, p. 375], and to facilitate the study of plant pathology.

Epiphytic diseases, for example the sooty moulds, interfere with the physiology and vital exchanges of the host by the shading of its surfaces. Trophic diseases have, initially, a distinct and definite phase in which the cells of the host and parasite are symbionts, for example phanerogamic parasites and their hosts. It results in nutrient or trophic exhaustion in the host, when the relationship becomes for the most part one of obligate parasitism.

Hypnochereutic diseases are characterized by the destruction of all the non-trophic tissues except the primary and secondary meristems, the fibrovascular bundles, and the photosynthetic and reproductive organs.

In auxonic diseases the development of the host is changed by the stimulus of a living pathogen or by an internal or external inorganic factor. They are classified under the sub-headings of (*a*) hypergenic, e.g., *Bacterium tumefaciens*, *Bact.* [*Xanthomonas*] *savastanoi*, *Plasmodiophora brassicae*, *Taphrina deformans*, and *Ustilago zeae-maydis* [*U. maydis*], viroses of the 'Fiji type' [sugar-cane Fiji disease

virus], and certain disturbances like lenticellosis and intumescences, however caused; (*b*) hypogenic including the abnormalities produced by certain aecidial stages of rusts and *Melampsorella* spp. and viruses of the yellows type, yellow dwarf, peach X-disease [virus] and [beet] Savoy [virus] disease; (*c*) agenic including those caused by [? mineral] deficiencies, physiological disorders, and simple mosaic virus diseases; (*d*) dysgenic including those in which there is a modification of the shape or disposition of the tissues and organs due to their modified growth without showing hyper- or hypogenesis.

Degenerative diseases include those of a regressive character, i.e., destroying the host elements. They are subdivided into (*a*) lytic diseases characterized by lysis of the middle lamella and less frequently of the cell walls, the subgroups being pectolysis, resinosis, gummosis, and mucosis; (*b*) all the different types of necrosis; (*c*) tracheo-toxic diseases such as tracheomycosis and tracheobacteriosis; and (*d*) leptotoxic diseases such as the phloem necrosis encountered in certain virus diseases.

Duché (J.) & Neu (J.). **Procédé rapide de préparation de milieux de culture au silicogel.** [A rapid method for preparing silica gel culture media.]—*C.R. Acad. Sci., Paris*, 229, 4, pp. 315–317, 1949.

Silica gel culture media, which have proved highly satisfactory as substitutes for agar (difficult to procure in France) for culturing purposes, may be prepared rapidly as follows [see next abstract]. A drop of chlorophenol is added to 50 ml. 2N hydrochloric acid in an Erlenmeyer flask of 250 ml. capacity and a dilution of commercial sodium silicate (240 gm.) in the selected nutrient medium (500 ml.) is poured into the container, the air having previously been withdrawn by boiling or preferably with a filter-pump. The solution thus obtained is rapidly transferred to appropriate culture vessels, in which a gel is formed within a few minutes; at this point the initial pH of 5·5 (indicated by a faint pink tinge) changes to between 6·5 and 7·3, according to the type of medium. The vessels are then sterilized in the autoclave for ten minutes at 120° C.

Duché (J.), Neu (J.), & Hoareau (M.). **Nouvelle technique de préparation des milieux de culture au gel de silice.** [A new technique for preparing silica gel culture media.]—*Rev. Mycologie*, 14, 2, pp. 129–131, 1949.

The method of preparation of silica gel culture media [see preceding abstract] has been simplified as follows. Twice the concentration of nutrient substances usually required is added to a solution of phosphoric acid (38 ml. per l.). Potassium silicate (200 ml. per l.) is used instead of sodium silicate. They are mixed by adding to 5 ml. of the phosphoric acid in a test tube (coloured with two drops of a pH indicator) the potassium silicate solution (approximately equal quantities) until a suitable pH is reached. The solutions are thoroughly mixed, the tube sloped, and the gel forms in a few minutes. The use of the pH indicator in subsequent tubes is rendered unnecessary by adding the same amount of silicate to each. Petri dishes 10 cm. in diameter are prepared by mixing 20 ml. nutrient phosphoric acid mixture with about 20 ml. of the silicate solution, the exact amount being determined by the pH indicator. The tubes or dishes are sterilized in the normal way. In order to obtain a gel without cracks it is imperative to allow the autoclave to cool slowly, taking three to four hours. At 30° C. the gel keeps without cracking for a month at least, but at higher temperatures it does not keep so long.

Raper (K. B.) & Alexander (Dorothy F.). **Preservation of molds by the lyophil process.**—*Mycologia*, 37, 4, pp. 499–525, 3 figs., 1945.

From work done on lyophilization of cultures [*R.A.M.*, 27, p. 329; 28, p. 634] at the Northern Regional Research Laboratory, Peoria, Illinois, started in 1941, it was found that almost all species of *Aspergillus* and *Penicillium* can be preserved in

lyophil, or desiccated form. Such evacuated preparations, tested at intervals up to 40 months were still viable and subcultures were typical. Representative Hyphomycetes were viable at 20 months. Of the Mucorales preserved, the viability of *Rhizopus* and *Phycomyces* as well as other genera was extended. Lyophilized moulds retain their biochemical and physiological characteristics unaltered. Strains of *A. terreus* produced undiminished yields of itaconic acid after 40 months while strains of *Penicillium notatum* and *P. chrysogenum* retained at original levels their capacity to produce penicillin. The lyophil technique provides a convenient means of preserving a large number of replicate cultures which can be used as 'seed' material for standard cultures or to set series of fermentations over a long time. Storage of the small sealed tubes is easy and possibilities of contamination eliminated.

Nielson (R. L.). **Bacillus mesentericus : an assay organism for penicillin.**—*N.Z. J. Sci. Tech.*, A, 30, 1, pp. 43–45, 1 fig., 1948. [Received December, 1949].

The use of *Bacillus mesentericus* as a test organism to replace *Staphylococcus* spp. in the plate method of penicillin assay has the following advantages: the organism is stable physiologically and culturally; it gives excellent definition in inhibitory zones with no ring formation; its growth in nutrient broth is homogenous and is rapid on plates; and it is non-pathogenic.

White (W. L.), Yeager (C. C.), & Shotts (Helen). **History, distribution and economic significance of the cellulose-destroying fungus Memnoniella echinata.** —*Farlowia*, 3, 4, pp. 399–423, 5 pl., 1 map, 1949.

Information collected during 1947 has shown that *Memnoniella echinata* [*R.A.M.*, 27, p. 487] is a tropical species, flourishing best in rain forests and regions of high humidity within 25 degrees of the equator. Its occurrence in temperate regions is sporadic, and there is as yet no evidence that it is established in the central and northern United States, England, or Central Europe. It was established conclusively that materials become infested after being transported to the tropics. In nature *M. echinata* attacks the purest forms of cellulose, e.g., cotton materials and paper. Untreated fabrics in transit and storage are those damaged primarily, especially when they are allowed to become moist with rain. The organism thrives best in moist, dark habitats where air circulation is limited but not prevented completely. For example, on Guam it was found growing extensively on grey canvas cots stored outdoors and covered with tarpaulins, but not on the tarpaulins themselves. In the same area it was found on grey medium-weight fabrics stored in a leaking tent, but was not among the several species of fungi growing and fruiting over the inner surface of the roof and on the side walls of the tent itself. The organism also develops commonly on corrugated cardboard cartons which have been in contact with the ground or have got wet.

On the basis of direct examination of a variety of materials from localities all over the world [which are fully recorded] *M. echinata* has been found on paper and fabrics in the tropics more frequently than any other single species. The fungi most frequently associated with it are, first *Gliomastix convoluta* [ibid., 28, pp. 584, 585] and second *Stachybotrys atra* [ibid., 27, p. 438]. The latter appears to be north temperate in its distribution, with a thinning out towards the tropics. The perithecia of *Ascotricha* spp. and *Chaetomium* spp. also occur fairly frequently on the materials mentioned.

Blake (J. T.) & Kitchin (D. W.). **Effect of soil micro-organisms on Rubber insulation.**—*Industr. Engng Chem.*, 41, 8, pp. 1633–1641, 10 figs., 4 graphs, 1949.

Evidence is presented that some of the rare failures in recent years of non-leaded, rubber-insulated underground cables were caused by soil micro-organisms. At the Simplex Wire and Cable Company, Cambridge, Massachusetts, laboratory con-

ditions were deliberately chosen to promote microbial infection so that greatly accelerated tests could be performed, in which failures like those found after ten years or more in service have been produced in a few weeks or months. These failures are characterized by minute, discrete, low-resistance spots. Drastic decrease of insulation resistance was used as the criterion of failure. The exact distribution of low-resistance spots was shown by an electrolytic test. Parallel tests in sterile and inactive soil proved that the failures were caused by living micro-organisms, including a species of *Actinomyces* and an unidentified fungus. In soil exposure tests natural rubber compounds were found to be more susceptible than synthetic. In some soils GR-S compounds were stable up to two years but they failed in a particularly active sample of market garden soil of initial pH 6·5 raised by calcium carbonate to 7·9.

The exact mechanism of attack is not known. Sometimes there is drastic electrical failure without perceptible surface effect.

Dominik (T.). **Występowanie mykorhizy u dzikich drzew owocowych rosnących w lesie.** [Mycorrhiza in wild fruit trees growing in forests.]—*Acta Soc. Bot. Polon.*, 19, 2, pp. 169–187, 10 figs., 1948. [French summary. Received December, 1949.]

After a review of literature dealing with mycorrhiza in cultivated fruit trees in general [*R.A.M.*, 26, p. 462], the author presents descriptions of the anatomy of 14 root samples from wild fruit trees collected by Mme H. Kowalska in the forest of the Institute of Agricultural Research, Puławy, Poland [? in 1948]. Microtome sections showed that *Pyrus communis* subsp. *piraster* and wild cherry (*Prunus avium*) had abundant ectotrophic and endotrophic mycorrhiza, the former preponderating. *Malus communis* subsp. *silvestris* had ectotrophic, endotrophic, and peritrophic mycorrhiza, all fairly equally distributed.

So far investigations have indicated that cultivated fruit trees have only endotrophic mycorrhiza [ibid., 17, p. 257]. The author gives suggestions for bringing woodland symbiotic fungi into the orchard and it is hoped that fruit trees with such true symbiotic fungi will not degenerate as rapidly as is usual under cultivated conditions. The problem of mycorrhiza in orchards should be considered a serious one and studied together with the use of soil fertilizers, which would be of major importance in this connexion.

Morel (G.). **Recherches sur la culture associée de parasites obligatoires et de tissus végétaux.** [Researches on the associated culture of obligate parasites and plant tissues.]—*Ann. Épiphyt.*, N.S., 14 (*Sér. Path. vég. Mém.* 5), pp. 123–234, 16 pl., 25 figs., 5 graphs, 1948. [Received November, 1949.]

In tissue culture studies [which are described in detail] carried out since 1943 [cf. *R.A.M.*, 27, p. 407; 28, pp. 35, 120] the author cultured crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) tissues from vine, tobacco, and *Abutilon avicennae* and found that they proliferate vigorously *in vitro* in the absence of heteroauxin and possess certain features resembling those of tobacco tissues which have become accustomed to heteroauxin, e.g., they form abundant masses of mammilate parenchyma. Tobacco tissues affected by tobacco mosaic virus and by potato viruses X and Y were also cultured; these viruses multiplied when inoculated into healthy tobacco tissue cultured *in vitro*.

Fleury (C.). **Action de la thio-urée sur l'Aspergillus niger. Effet fongistatique.** [The action of thiourea on *Aspergillus niger*. Fungistatic effect.]—*Bull. Soc. vaud. Sci. nat.*, 63, 270, 20 pp., 1 pl., 1 graph, 1948.

The author summarizes the results of his own and other workers' investigations on the effects of thiourea on the growth of *Aspergillus niger* [cf. *R.A.M.*, 26, p. 148;

27, p. 147; 28, p. 111]. He concludes that the fungistatic action of this substance upon *A. niger* has now been established, the toxic semi-dose [LD 50] in his experiments lying between 1·7 and 1·8 per mille. There would appear to be some correlation between fungistasis and the molecular configuration of thiourea.

Libby (W. C.) & Akeley (R. V.). **Potato variety testing and release program in Maine.**—*Amer. Potato J.*, 26, 11, pp. 404–409, 1949.

A co-ordinated, systematic plan for potato variety development, testing, and increase in Maine has as its object the orderly release to seed potato growers of superior potato varieties with low initial virus disease readings. The authors briefly describe the methods in operation for carrying out this programme. In varietal trials, resistance of seedlings to blight [*Phytophthora infestans*: *R.A.M.*, 28, pp. 139, 483], bacterial ring rot [*Corynebacterium sepedonicum*: ibid., 27, p. 37], leaf roll [ibid., 26, p. 165], common scab [*Actinomyces scabies*: ibid., 27, p. 34], various mosaic virus complexes [ibid., 27, p. 334], and the green peach aphid [*Myzus persicae*] are of particular concern.

Stevenson (F. J.). **Old and new Potato varieties.**—*Amer. Potato J.*, 26, 11, pp. 395–404, 1949.

The author discusses old and new potato varieties grown in the United States [*R.A.M.*, 28, p. 76], and states that of the 51 varieties found in the 1948 certified lists, 31 have been distributed during the past 17 years and make up 44 per cent. of the total certified 'seed'. Of these, 13 varieties (seven old and six new) constitute about 96 per cent. of the total [ibid., 27, p. 85]. Katahdin heads the list with Irish Cobbler next and Triumph third. The disease resistance, yield, quality, and distribution of each variety is tabulated. Katahdin maintains its immunity from net necrosis and shows some resistance to leaf roll. The new varieties have been a factor in increasing yields in the United States from 100 bush. per acre 25 years ago to more than 200 bush. in 1948.

Kassanis (B.). **Potato tubers freed from leaf-roll virus by heat.**—*Nature, Lond.*, 164, 4177, p. 881, 1949.

In 1949 at Rothamsted Experiment Station, Majestic and Arran Consul potato tubers, infected with leaf roll virus and potato virus X [*R.A.M.*, 28, p. 479], were placed in an incubator at 37·5° C. [cf. ibid., 22, p. 220] and kept moist by a flat, open dish full of water. All untreated tubers produced typical leaf roll plants; some of those heated for from 10 to 20 days developed typical symptoms, but none of the tubers that survived 25 or more days' heating produced leaf roll plants. All still contained potato virus X.

Lal (T. B.). **Occurrence of late blight in the plains of India.**—*Indian Phytopathology*, 1, 2, p. 164, 1948 [? 1949].

During a survey of the potato crop in the plains of northern India in 1942–3, blight (*Phytophthora infestans*) [*R.A.M.*, 24, p. 430; 27, p. 411; 28, pp. 114, 160; 29, p. 49] was observed for the first time at Meerut (on Gola potatoes) and Dehra Dun (on Tumri) in March, 1943, in the second crop. On 5th March about 1·4 per cent. of the plants at Meerut were affected, the figure in one plot being 56 per cent.; at Dehra Dun only two affected plants were found in March. In the first week of April average incidence in the two localities was 9·3 and 1·3, respectively, with up to 29·5 per cent. at Meerut. Both *P. infestans* and early blight [*Alternaria solani*: ibid., 27, p. 411; 28, p. 114] occurred on the same leaf at Meerut, such combined infection ranging from 1·2 to 1·6 per cent. at the two inspections.

The appearance of the disease in the second crop is attributed to the planting of infected tubers imported from the hills. These, apparently, had not been exposed

to the high summer temperatures of the plains, and *P. infestans* had therefore remained viable. Exposure to high temperature kills the fungus, if present, and local tubers usually produce healthy crops.

Emilsson (B.) & Gustafsson (N.). **Undersökningar beträffande bekämpning av bladmögel och brunröta hos Potatis. IV. Fortsätta försök med blastdödande medel.** [Studies relating to the control of Potato blight. IV. Further experiments with haulm-killing preparations.]—*K. LandtbrAkad. Tidskr., Stockh.* (formerly *K. LandtbrAkad. Handl., Stockh.*), 88, 2, pp. 188–200, 1949. [English summary.]

In further comparative trials at the Plant Research and Cold Storage Institute, Nynäshamn, and elsewhere in Sweden, on the efficiency of certain chemical haulm-killers in controlling potato blight [*Phytophthora infestans*: *R.A.M.*, 28, p. 236], sulphuric acid and TAC [tar acid compound] 46 (a substitute for TAC 2), reported from England [ibid., 26, p. 562] to be harmless to the skin, again proved superior to the other compounds tested. The former was effective at a concentration as low as 4 per cent., but should be used at 8 to 10 per cent. to ensure absolutely reliable control; the strength recommended for TAC 46 is 10 per cent. A dinitrophenol compound of the same type as dowspray 66 improved and known as Ewos 936 (AB. Ewos, Södertälje), closely approached the two foregoing in efficacy, though its action was considerably less rapid; it may safely be used in ordinary spraying machines.

The maximum degree of control of tuber infection was obtained with 12 per cent. sulphuric acid, which reduced the incidence of tuber rot from 11·6 and 0·5 per cent. The effect of haulm-killing on yield is analysed from different angles and illustrated by the available experimental evidence. It appears that the decrease in total yield is more than outweighed by the increased percentage of large tubers (5 to 9 cm. class) and the reduction of tuber rot. The maximum gain from this source was computed at 38·1 per cent.

Callbeck (L. C.). **Potato vine killing in Prince Edward Island.**—*Amer. Potato J.*, 26, 11, pp. 409–419, 1949.

Much of the information in this paper has already been noticed [*R.A.M.*, 27, p. 581; 28, p. 483]. The author states that the addition of sodium chloride also increases the phytotoxicity of sodium arsenite vine killers used for preventing tuber rot caused by late blight [*Phytophthora infestans*: ibid., 28, p. 638 and preceding abstract]. A new British product, lotemcide, used at 10 per cent., gave a very rapid and complete destruction of the foliage in 1948, but with some discoloration of the tubers. A lower concentration would evidently be satisfactory.

Stille (B.). **Untersuchungen über die Haltbarkeit verschiedener Kartoffelsorten während der Lagerung bei hoher Temperatur und hoher relativer Luftfeuchtigkeit.** [Investigations on the keeping quality of different Potato varieties during storage at high temperature and high relative atmospheric humidity.]—*Dtsch. Lebensm.-Rundsch.*, 44, 11, pp. 237–239, 1948.

In the first of a series of preliminary experiments at the State Research Institute for Food Preservation, Karlsruhe, Germany, to determine the relative susceptibility of 17 potato varieties to spoilage in storage, initiated on 27th November, 1942, the temperature was maintained at 28° C. and the relative humidity at about 95 per cent. After 80 days the loss of weight (attributed mainly to the wet rot caused by *Bacterium phytophthorum* [*Erwinia phytophthora*: *R.A.M.*, 28, p. 306]) ranged from 9·8 per cent. in the late variety Prisca to 62·9 per cent. in the early Frühmölle. Ackersegen (late) also lost little weight (10·8 per cent.) and the reductions in Erdgold (late), Frühbote (early), Böhms Mittelfrühe (second early), and Voran (late),

estimated at 16·5, 17·3, 14·8, and 18·5 per cent., respectively, were also of a moderate order. On the other hand, heavy losses in weight were incurred by Edelgard (late), Merkur (late), and Flava (second early), amounting to 52·6, 52·4, and 33·8 per cent., respectively. The results of the second test, started on 22nd March, 1943, substantially corroborated those of the foregoing, though the losses in weight were uniformly heavier owing to the long period elapsing since the harvest. Ackersegen lost the least weight (18·8 per cent.), followed by Prisca (23·8), Erdgold and the late variety Ostbote (both 26·6), and Böhms Mittelfrühe (28·1), while Frühmölle lost the most (71·6), with Sieglinde next (57·3). The starch content of the several varieties decreased in the same order as their weight.

In supplementary tests the most perceptible deterioration in palatability occurred in the varieties with the heaviest losses in weight. These varieties, moreover, proved to be much more susceptible than the others to inoculation with the expressed juice of rotted potatoes, Frühmölle contracting 100 per cent. wet rot and Ackersegen 40 per cent. *E. phytophthora* was the only pathogen isolated from the diseased material, although the inoculum contained a variety of micro-organisms.

De Silva (C. A.). **Botanical and Mycological Department.**—*Rep. Rubb. Res. Bd Ceylon, 1948*, pp. 5–13, 1949.

It is stated in this report [cf. *R.A.M.*, 28, p. 194] that after three years of mild infection of rubber by *Oidium* [*heveae*] in Ceylon, there was a rather severe attack on budgrafts and seedlings in 1948. Sulphur dusting was carried out as usual. Most trees finally refoliated satisfactorily after more than one defoliation, especially those 25 to 35 years old. Certain clones which sustained a mild attack in one area were badly affected in another. The clone museum on Kepitigalla Estate, Matale, planted in 1941 with over 50 different clones, contained no resistant material. Leaf fall due to *Phytophthora* spp. was not serious. The only root disease of economic importance was *Fomes lignosus* [see next abstract]. Owing to the expense of replanting, felling and uprooting are not thoroughly carried out and the presence of root disease is often overlooked. A few hours' delay in the inspection of uprooted carriers obscures the disease on exposed taproots, especially in dry weather, and diseased laterals then remain in the soil as potential sources of infection. The cleaning up of isolated pockets of infection is becoming a costly item in replanting work.

Brown bast [ibid., 27, p. 541; 29, p. 53] still causes concern in young budded and seedling areas. Five years' work with different treatments have given disappointing results. The best course is to regard the first signs of dryness on tapping cuts as incipient brown bast and to rest the trees. Periodic inspections should then be made, opening the cuts for signs of recovery. Resting trees can be treated by light scraping and the application of disinfectants during dry weather; there is some indication of benefit from light scraping on trees rested on the first sign of dryness. Incidence is controllable in young rubber areas by adopting the correct intensity of tapping during the first three to four years, which appears to be the most susceptible period. This is particularly applicable to certain high yielding clones, such as Glenshiel 1 and Tjirandji 1. On many estates brown bast has been arrested by reducing the intensity of tapping during the third and fourth years of the operation from 100 to 67 per cent.

Berwick (E. J. H.). **The removal of standing Rubber on coastal clays.**—*Malay. agric. J.*, 32, 4, pp. 298–303, 7 pl., 1949.

It is pointed out that the presence of root diseases (*Fomes noxius*, *F. lignosus*, *Ustulina zonata*, *Ganoderma pseudoferreum*, and *Sphaerostilbe repens*) [*R.A.M.*, 28, p. 271] in the standing rubber of Malaya and the susceptibility of the crop to be planted in its place will influence the choice of implements to be used in felling.

A table of the susceptibility in Malaya of coco-nut, oil palm, tea, cacao, and Manila hemp [*Musa textilis*] to the five root pathogens is given. If the incidence of root disease is high and a susceptible crop is to be planted the bulk of the old rubber root system should be removed. The most common method of destroying rubber trees in Malaya at present is by poisoning with sodium arsenite [ibid., 27, p. 540] which is cheap and effective but has certain disadvantages when root disease is present. Felling by tree-dozers is suggested.

Nicholas (D. J. D.). **The use of Aspergillus niger for the determination of mineral nutrients available in soils to crop plants.**—*Chem. & Industr., 1949*, 47, pp. 809–810, 1949.

This is a summary of a paper presented at a meeting of the Food Group of the Society of Chemical Industry on 12th October, 1949. The use of *Aspergillus niger* for the determination of mineral nutrients in soils [*R.A.M.*, 27, p. 93] is based on the inability of the mould to accomplish its life-cycle in the absence of certain elements in the culture solution [ibid., 25, p. 81], namely, the macronutrients nitrogen, phosphorus, potassium, magnesium, calcium, and sulphur, and the micronutrients zinc, copper, iron, manganese, molybdenum, and possibly gallium and vanadium. Moreover, the response to the addition of an essential mineral nutrient from deficiency to sufficiency level, others being present in adequate supply, is specific and quantitative. The standard growth series thus obtained is assessed visually, taking into account mycelial growth, spore development, and dry weight yields of the mould. For bioassay work on soils, therefore, a known amount of air-dry soil is added to the culture solution containing all the nutrients except the one to be studied [ibid., 28, p. 322].

Special procedures for the purification of nutrients used in the culture solution are necessary for the bioassay of magnesium, copper, zinc, iron, manganese, and copper, methods for the removal of which are described. In all instances the purified macronutrient solutions are used for the full nutrient cultures and the missing element is added subsequently. In this way any fungicidal effects resulting from the purification treatment can be observed. Micronutrients to be tested are recrystallized from glass-distilled water and should, if possible, be checked spectrographically before use.

By means of the techniques described, satisfactory growth curves are obtained for manganese, 25 to 400 mgm.; copper, 0·05 to 2 mgm.; zinc, 0·1 to 5 mgm.; iron, 0·01 to 1 mgm.; manganese, 0·0001 to 0·1 mgm.; and molybdenum, 0·0001 to 0·02 mgm. Applied to soil problems, the bioassay method has shown magnesium deficiency in the presence of potassium shortage, a point which may not be revealed by chemical analysis of crop plants; copper deficiency in alkaline fen soils in East Anglia and elsewhere; and zinc deficiency in a horticultural soil where fruit trees exhibited 'little leaf' symptoms [ibid., 25, pp. 98, 124; 27, p. 424 *et passim*]. Because of the extreme sensitivity of the method, especially for molybdenum, it has been used to determine micronutrient levels in tissue extracts and in plant ash.

Thomas (C. A.). **Observations on diseases of some special crops.**—*Plant Dis. Reptr*, 33, 12, pp. 453–454, 1949. [Mimeographed.]

In August, [? 1949], seed capsules of castor bean [*Ricinus communis*], growing in an experimental planting at Beltsville, Maryland, wilted and turned brown prematurely, owing to an attack by *Alternaria ricini* [*R.A.M.*, 26, p. 354]. Sometimes the entire inflorescences were infected with resultant poor seed production. Of 3,000 capsules in a commercial planting at Odenton, Maryland, 21·8 per cent. were diseased. A moderate amount of leaf spotting also occurred.

A commercial planting of *Digitalis lanata*, near Oley, Pennsylvania, was completely destroyed in 1948 by anthracnose (*Colletotrichum fuscum*) [ibid., 25, p. 252].

The fungus is seed-borne, it fruits on damped-off seedlings and is easily spread in the seedbed. Tests conducted in 1949 showed that selection of clean plants from an affected seedbed resulted in only fair control, while the use of disease-free seed, sown in areas where *Digitalis* has not been cultivated, gave rise to healthy plants. In greenhouse inoculations *D. purpurea*, *D. ambigua*, and *D. ferruginea* were susceptible, but in the field the first two were relatively free from infection. *D. purpurea* plants left in the field during the winter for seed production were moderately spotted with anthracnose lesions the following June.

Safflower rust (*Puccinia carthami*) [ibid., 28, p. 309] was prevalent in August, 1949, in experimental plantings at Scottsbluff, Nebraska, leaves of susceptible selections being completely covered with rust pustules. Nebraska 852 [loc. cit.] in several commercial fields in the vicinity was also attacked. It appears that the disease may become an increasing menace.

During the summer of 1948 *Rhus glabra* seedlings in a seed-bed at Beltsville were severely attacked by powdery mildew (*Sphaerotheca humuli*), reducing the stand by over one-third. Only fair control was obtained with fermate at 2 lb. per 100 gals. Sulphur dusting was very injurious. *R. copallina* and *R. typhina* were not affected.

Anthracnose (*Gloeosporium* sp.) caused heavy losses to experimental plantings of coriander at Beltsville in 1948 and 1949. Infection of floral parts, which caused considerable yield reduction, and stem lesions resulted in death of the tops, giving them a blighted appearance. The late-maturing Russian type was more seriously affected in the field than the early Moroccan type, although both proved very susceptible when inoculated in the greenhouse. Conidia are seed-borne and cause damping-off of young seedlings.

Sudden death disease of Cloves in Zanzibar.—*World Crops*, 2, 1, p. 29, 1 fig., 1950.

A plan has been proposed for controlling 'sudden death' of cloves [*R.A.M.*, 27, p. 276] on Pemba, by cutting out and burning all diseased trees and those in their immediate vicinity, clearing the surrounding vegetation, and insecticidal spraying. The plan may involve removing 60,000 trees. The cleared areas are to be planted with food crops for two years before cloves are replanted; growers are to be compensated.

Mahamud (K. A.). **Isolation and growth of Cercospora piperata n.sp. on culture media.**—*Mag. agric. Coll. Nagpur*, 24, 1–2, pp. 8–11, 1949.

This paper describes the isolation and cultural morphology of *Cercospora piperata* from long pepper (*Piper longum*) [*R.A.M.*, 26, p. 354]. On 5 per cent. rice meal agar colonies were at first bright green, later dull greenish grey, and reached their maximum growth (1 cm. diameter) after 15 days at 22° C. Conidia were produced in only two cultures, starting when they were seven to eight days old.

Hughes (C. G.). **Mechanization of seed Cane disinfection.**—*Cane Grs' quart., Bull.*, 12, 2, pp. 51–58, 1948. [Abs. in *Sugar*, 44, 9, p. 50, 1949.]

The treatment of cut ends of sugar-cane seed pieces with a solution of an organo-mercurial compound, e.g., agrosan or aretan, destroys the micro-organisms attempting ingress, ensures normal germination, and appears to stimulate bud and shoot development. Some cane-growers in Queensland have devised a method for reducing the operation to field practice [*R.A.M.*, 28, p. 197]. The stalks are cut into short lengths. Three detachable boxes, built of angle-iron and 6 by 1 in. wooden slats, are used for the tractor-drawn planting machine. Each box holds about 1,200 lb. cut seed pieces, sufficient to plant 2,700 ft. When a box is full it is lifted

by a small crane operated from a tractor and lowered into a steel tank, 4 ft. by 4ft. by 69 in. containing 300 gals. disinfectant (1 lb. agrosan per 10 gals. water), its total capacity being 675 gals. The box containing the seed cane is kept in the solution for five minutes, then allowed to drain for another five, and set on the planting machine, from which an empty box has been removed. Thus, there is one box being filled with seed pieces, another on the planter in use, and a third in the tank or draining, so that a minimum of time is lost. Using this outfit, five acres can easily be planted daily. The method is recommended for use when planting has to be done under excessively wet or dry conditions or when soil temperatures are low. Aretan (0·5 per cent.) should be substituted for agrosan when the soil is dry.

An innovation, apparently limited to the Grove Farm Plantation, Hawaii, is a mechanical cane-stalk cutter, which has been constructed to save the labour and expense involved in cutting by hand. It consists of a platform across which moving chains carry bundles of stalks, broadside on, to circular saws for cutting into pieces of the requisite length. The cut pieces fall into a bath of fungicide, from which they are automatically elevated into a hopper and thence transported in bulk to the planting machine—usually designed to plant two rows simultaneously. This method is more suitable for use on large areas, and that practised in Queensland for the small grower.

New Cane disease in Queensland.—*Circ. Qd Cane Grs' Coun.* 'C' 23, 1949. [Abs. in *Sugar*, 44, 10, p. 53, 1949.]

The obscure disease on the Q. 28 sugar-cane variety [*R.A.M.*, 28, p. 243] in the Mackay area of Queensland causes heavy losses in the ratoon crops. After three years' fruitless efforts to trace the source of the trouble, a pathogen (probably of the virus type) has been implicated. Healthy Q. 28 plants were inoculated with juice from affected stalks and planted together with others inoculated with clean cane juice. No difference was noticeable in the plant crop, but in the first ratoons the stools from plants inoculated with diseased juice were stunted, reaching only one-third of the height of those inoculated with clean juice. Infection can be spread by means of cane knives and the knife in the cutter-planter. The extraordinary aspect of the disease is the absence of any conspicuous symptoms from the plant crop, even when infected planting material is used, severe stunting being apparent only in the ratoons. However, substantial losses are incurred in the plant crop. In two trials in the affected district healthy and diseased stands of one variety yielded 36 and 27 tons per acre, respectively, and of another 30 and 24 tons, respectively.

Stevenson (G. C.). **Deterioration of Sugar Cane varieties.**—*S. Afr. Sug. J.*, 33, 10, pp. 657, 659, 661, 663, 1949.

In this paper, presented at the B.W.I. Sugar Technologists' Conference, 1947, the author cites some important examples of deterioration in sugar-cane due to epiphytotic diseases. Thus, the sudden failure of Otaheite (Bourbon) in Mauritius and Réunion in 1840 was apparently caused by root disease. The same cane failed in Brazil about 1860 as a result of gumming disease [*Xanthomonas vasculorum*], and had to be abandoned in Puerto Rico about 1872 and in the West Indies between 1890 and 1895. At the end of the 19th century Bourbon collapsed also in British Guiana after about 100 years of cultivation. Mosaic disease was responsible for major varietal changes in Louisiana, Puerto Rico, Natal, and other countries, while the production of new varieties by breeding was instigated by the development of sereh disease in Java about 1880.

Instances of a gradual access of pathogenicity in facultative parasites under conditions of monovarietal sugar-cane cultivation in Louisiana are to be seen in the root-rotting organisms [*Pythium* spp.] and red rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*].

ROGERS (D. P.). **Nomina conservanda proposita and nomina confusa—fungi.**—*Farlowia*, 3, 4, pp. 425–493, 1949.

The author lists 113 generic names of fungi, which have been proposed for conservation from time to time [*R.A.M.*, 20, p. 178 and next abstract], and discusses the reasons put forward by various authors for doing so. Notes are also given on 17 names declared nomina specifica confusa and on 16 nomina generica confusa. In the bibliography appended the citation of all proposals, or comments on proposals for conserving generic names, has been attempted.

DONK (M. A.). **Nomenclatural notes on generic names of Agarics (Fungi : Agaricales).**—*Bull. Jard. bot. Buitenz.*, Ser. III, 18, 3, pp. 271–402, 1949.

Nomenclature notes concerning about 100 generic names have been collected in an attempt to fix the type species of the older validly published names of agarics, a denomination applied to cover the same range as *Agaricus* L. ex Fr., as published in Fries' Systema (1821). The results are sometimes at variance with Singer and Smith's list of type species [*R.A.M.*, 25, p. 475].

In chapter 1 some of the principles adopted for fixing type species of generic names and the status preferably to be assigned to certain kinds of homonyms are briefly discussed. The chapters following deal with the generic names of Persoon, Fries, and S. F. Gray. The author draws attention to the fact that the publications of F. Staude (Die Schwämme Mitteldeutschlands . . . (Festgabe . . . Versammlung deutscher Land- und Forstwirthe zu Coburg) 1857), and P. Kummer (Der Führer in die Pilzkunde, 1871) have been entirely ignored in making author's citations and a list of changes required is given.

GUYOT (A. L.), MASSENOT (M.), & MONTEGUT (J.). **Contribution à l'étude des cryptogames parasites de la France septentrionale III.** [Contribution to the study of the parasitic cryptogams of northern France III.]—*Rev. Mycologie*, 14, 2, pp. 61–84, 9 figs., 1949.

The third contribution in this series contains notes on 33 fungi found on 43 different phanerogamic hosts in northern France [cf. *Rev. Mycologie*, 11, pp. 53–72, 7 figs., 1946] at various times, including *Leptosphaeria eustoma* on living pear leaves collected at Grignon in 1948. Associated with it on the same brown spots were pycnidia of *Septoria piricola* (the perfect state of which is *Mycosphaerella sentina*).

RAYSS (T.). **Contribution à la flore mycologique du Proche Orient.** [A contribution to the mycological flora of the Near East.]—*Bull. Soc. mycol. Fr.*, 62, 1–2, pp. 5–41, 4 figs., 1946. [Received October, 1949.]

This critically annotated list of fungi in countries adjoining Palestine [cf. *R.A.M.*, 28, p. 247], based on material collected by the author in the Lebanon in 1941 and 1942 and on that preserved in the phanerogamic herbarium of the Hebrew University of Jerusalem, contains 100 species in 23 families parasitic on 126 host plants, 36 of which are probably new host records. It includes three new species and two new forms.

PAVGI (M. S.) & MUNDKUR (B. B.). **A third contribution towards a knowledge of Indian Ustilaginales.**—*Indian Phytopathology*, 1, 2, pp. 107–118, 1948 [? 1949].

This final contribution to the present series [cf. *R.A.M.*, 20, p. 179] comprises 36 species of Indian Ustilaginales, several of which are of economic importance. There are three new species, one new variety, and one new combination. It is stated that *Sphacelotheca destruens* [ibid., 23, p. 481], because of the presence of evanescent spore-balls, would appear to belong to *Sorosporium*.

Johnson (E. M.) & Valleau (W. D.). **Synonymy in some common species of Cercospora.**—*Phytopathology*, 39, 10, pp. 763–770, 1949.

Tobacco frog eye, usually attributed to *Cercospora nicotianae*, is a prevalent and sometimes severe disease in the field in Kentucky [*R.A.M.*, 20, p. 181], and the question arose whether the infection in these outbreaks proceeded from a previous tobacco crop or from other hosts of the pathogen.

Cultures of *Cercospora*, obtained by streaking on potato dextrose agar conidia from 28 plant species in 16 families, were grown on tobacco agar at 27° C. in the dark. Typical frog eye developed on tobacco inoculated with isolates from 16 species in 11 families, namely, tobacco, *Petunia hybrida*, *Physalis subglabrata*, *Campanula* sp., *Coreopsis* sp., *Ipomoea hederacea*, cabbage, *Barbarea vulgaris*, vegetable marrow, *Lamium amplexicaule*, *Lathyrus latifolius*, *Lupinus polyphyllus*, bean (*Phaseolus vulgaris*), *Phytolacca decandra*, *Phlox paniculata*, and *Viola* sp. A number of the isolates attacked bean, cabbage, beet, *Petunia*, *Nicotiana rustica*, pansy, and cantaloupe.

Neither pathogenicity based on host range nor morphology has been given sufficient attention in the designation of new species of *Cercospora*, which are usually named after the plant on which they are found. The authors' experimental results and those of Wells [ibid., 3, pp. 184, 556], Vestal [ibid., 13, p. 415], and Horsfall [ibid., 9, p. 319] indicate that the host range of some species of *Cercospora* is extremely wide and that many species regarded as distinct are in reality identical. According to Lieneman [ibid., 8, p. 526] the type species of the genus is *C. apii*, and Vestal demonstrated the development of typical *Cercospora* leaf spot on celery inoculated with *C. beticola*. No true morphological differences have been found between *C. beticola* and *C. nicotianae*, and both in Vestal's and the present studies the two fungi caused infection on nine families in common. Ample evidence is thus forthcoming for the identification of *C. beticola* and *C. nicotianae* with *C. apii*, and the authors further propose to relegate to synonymy with the last-named 43 other species, a list of which is given [ibid., 26, p. 515].

Frágner (P.). **On the variability of Penicillia.**—*Publ. Fac. Sci. Univ. Charles* 186, 30 pp., 6 pl., 4 diag., 1 fig., 1948; 190, 20 pp., 5 pl., 1 diag., 3 figs., 1949. [Czech and French summaries].

In studies conducted at the Charles University, Prague, Czechoslovakia, the author isolated from a pure culture of *Penicillium westlingii* various different forms, some of which appeared naturally; others were induced by the action of hydrochloric acid on the conidia. The differences were retained on various media and were not sharply pronounced, but graduated, forming a continuous series. According to present classifications [cf. *R.A.M.*, 29, p. 122] they would represent different species (e.g., *P. chrysogenum*, *P. sartoryi*, *P. waksmanii*). The author suggests that hybridization is a possible explanation.

In the second paper some 40 new forms are described, which dissociated during repeated isolations from a culture belonging to the *P. expansum* group isolated from mouldy bread. These forms belong, according to the present system of classification, to several different subgenera and sections or even to *Aspergillus*. The present delimitation of *Penicillium* species is considered incorrect, as there is no sharp division between *Penicillium* and *Aspergillus* since transitional forms exist. The author demonstrates the correlation between the microscopic appearance, macroscopic shape of colonies, and their sensitiveness to trypaflavine and cacodyl acid. An attempt is made to arrange some of these new forms into natural groups according to their morphological and physiological characteristics.

First symposium on blister blight control.—*Plant. Chron.*, 44, 23, pp. 628–630, 1949.

At the symposium on control methods for tea blister blight [*Exobasidium vexans*: *R.A.M.*, 28, p. 548], which took place in Ceylon on 10th November, 1949, it was

reported that if copper spraying [ibid., 26, p. 569] was done after a round of plucking, by the time the next round was made it was estimated that, if there had been little rain, the copper content of the made tea would not exceed the tolerance limit set by the Food and Drug Authorities. During a discussion on large-scale spraying it was agreed by F. W. J. LANE of Plant Protection Ltd. and R. M. GREENSLADE of Pest Control Ltd. that the only practical method of spraying in the case of the majority of estates was with the knapsack sprayer organized on a battery system with a central charge pump.

Nursery stock, plant, and seed quarantine (No. 37).—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 173, pp. 85–100, 1949.

This announcement brings into effect the suggested revision of the foreign plant import regulations (Quarantine 37) [*R.A.M.*, 29, p. 112] as from 1st January, 1949.

Plant-quarantine import restrictions.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 174, pp. 120–130, 134–139, 1949.

TASMANIA. According to Proclamation No. 27P of 23rd June, 1948, the importation of hops (commercial product of the hop plant) into Tasmania is prohibited except from countries known to be free from downy mildew (*Pseudoperonospora humuli*) and hop mosaic virus.

BELGIUM. A revised circular gives a summary of prohibited, restricted, and unrestricted plant imports into Belgium. Grape vines are prohibited; potatoes may only be imported when certified from a region free from wart disease (*Synchytrium endobioticum*) [cf. *R.A.M.*, 19, p. 576]. A wart-free region is defined (with model certificates shown) and the authorized ports of entry listed.

HOLLAND. A revised summary (superseding P.Q.A.C. 303) of Dutch plant import restrictions is given. Gooseberry plants may enter only at appointed places and if free from American gooseberry mildew [*Sphaerotheca mors-uvae*]. Legislation regarding potatoes, according to a decree of 13th December, 1935, demands freedom from wart disease.

UNITED STATES. A list of current quarantine orders applying to the continental United States and shipments from and to Hawaii and Puerto Rico is appended as well as other restrictive orders regarding entry of plants and plant products. There are also Mexican border regulations and those governing sanitary export certification.

Customs (importation) (prohibition) (fruit, plant and vegetables) proclamation, 1949.—*Jamaica Gaz. Suppl.*, 72, 51, pp. 273–276, 1949.

This proclamation brings together all matters concerning the importation of plants, fruit, vegetables, etc. formerly dealt with separately. Special attention is drawn to the fact that fruit and vegetables may no longer be imported from the Bahamas; potatoes may be imported from the United Kingdom, Eire, United States, and Holland, if accompanied by a certificate of freedom from wart disease (*Synchytrium endobioticum*) and its absence from a radius of five miles of their place of origin. Potatoes from Canada, United States, and Holland must be certified free of ring rot (*Corynebacterium sepedonicum*).

MATHUR (R. S.). **Basis of plant quarantines.**—*Indian Phytopathology*, 1, 2, pp. 159–163, 1948 [? 1949].

The author discusses the case for the establishment of plant quarantine regulations, dealing with the continuous and discontinuous spread of pests and diseases, biological aspects of the problem, economic considerations (i.e., expenses and losses involved in plant quarantines and economies effected thereby), the necessity for quarantines, public support in relation to enforcement, and administration in the United States.